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IBM hosts, FEPs to get APPN boost

By Paul Desmond
Senior Editor

WHITE PLAINS, N.Y. — IBM appears close to announcing Advanced Peer-to-Peer Networking (APPN) capabilities for its mainframes and front-end processors, an enhancement that promises to give users greater flexibility in building and using SNA networks.

Sources close to the company said IBM is also planning to double the CPU power of its 3745 Communication Controller, enabling it to support larger networks and more high-speed interfaces.

The date of the announcements could not be confirmed. Some sources said they expect them as soon as next week, while others said they may not be made until March.

APPN support is expected to be added to the Network Control Program (NCP) software, which controls IBM front-end processors, as well as to complementary host VTAM software.

APPN is designed to support peer-to-peer communications between processors in a network, as well as the dynamic addition and deletion of net nodes. It is now only fully supported on the Application System/400 and System/

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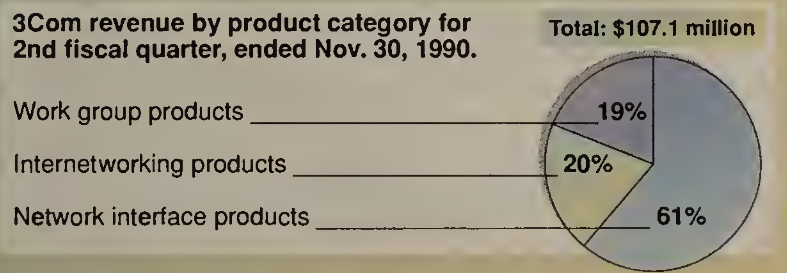
3Com's 3-point plan

- **Focus product development and marketing on network adapters and enterprise networking products such as hubs, bridges, routers and communications servers.**
- **Divest work group-related products, including network operating systems, network servers, network statlons and SNA work group connectivity products.**
- **Reduce its 1,953-person work force by 12% to bring company's infrastructure in line with its new business focus.**

3Com revenue by product category for 2nd fiscal quarter, ended Nov. 30, 1990.



GRAPHIC BY SUSAN J. CHAMPENEY SOURCE: 3COM CORP., SANTA CLARA, CALIF.

New tools ease software distribution for LAN users

Emerging products help users install, upgrade software on PCs, servers throughout network.

By Maureen Molloy
Staff Writer

A growing number of tools are becoming available to help users manage the daunting task of distributing software to hundreds, even thousands, of LAN-based workstations.

These software distribution systems enable users to download application and operating system code to local-area network servers or workstations, as well as maintain information about which packages and versions each device is running. The products promise to greatly reduce the cost and effort of deploying new applications and upgrades.

Digital Equipment Corp., IBM, NCR Corp., Systems Center, Inc. and Unisys Corp. are among the vendors that have introduced products designed to simplify the installation and updating of software across enterprise nets.

"Software distribution is a hot issue, given the growth in LANs

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3Com bows out of LAN software mart

Bequeaths LAN Manager development to Microsoft and refocuses on adapter, interconnect business.

By Bob Brown
Senior Editor

SANTA CLARA, Calif. — In a joint press conference here last week, 3Com Corp. and Microsoft Corp. announced plans to merge their respective versions of LAN Manager into a single operating system to be developed and sold by Microsoft.

The announcement was the result of 3Com's decision to exit the network operating system market, part of a broader 3Com plan to shift its focus from work group products to internetworking and connectivity products.

The transferal of 3Com's network operating system technology and customer base to Microsoft is expected to clear up some recent confusion about the jointly developed LAN Manager.

"The customer now knows that Microsoft will be the ongoing provider of net operating system functionality," said Mike Murray, general manager of Microsoft's Networking Business Unit.

3Com's departure from that market falls under a separately announced three-phase business plan. That program calls for the company to sell off its work group-related businesses, including network operating systems,

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Users react to news; 3Com chief Eric Benhamou discusses decision, page 57.

New test shows 16M bit/sec token ring 'really flies'

See story, page 43.

AT&T slips with service safeguards

By Bob Wallace
Senior Editor

BASKING RIDGE, N.J. — AT&T last week acknowledged that it is behind schedule in implementing some key measures designed to fortify its 800 service against outages such as the nine-hour crash that crippled its network one year ago this week.

Although several of the eight safeguards announced in April 1989 are behind schedule, the remainder are on track.

The safeguard program promised everything from alternate-path routing to a new switch-based number translation capability and a separate backup signaling network that could be used in the event that the main signaling net goes down.

"We're concerned about these delays," said John Doggett, director of applied technology for the

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NETLINE

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USERS MERGE SNA data onto multiprotocol backbone nets. Page 2.

NCR SOFTWARE helps users build distributed OLTP applications for Unix servers. Page 2.

AT&T TO BEEF UP Starlan line with new offerings. Page 2.

WANG, NOVELL UNITE to give NetWare 386 LAN users image processing capabilities. Page 6.

FCC REFINES some price cap regulations, leaves larger questions looming. Page 6.

AT&T SHIFTS national accounts reps to low-end sales group. Page 6.

SELF-HEALING NETS offer carriers promise of fast recovery after outages. Page 56.

NEWSPAPER

FEATURE

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SONET technology brings solutions and questions

Technologies of the future

By Paulina Borsook
Special to Network World

Hot new technical buzz words often assume a muzzy life of their own — a life unrelated to the underlying technology.

Take, for example, Synchronous Optical Network (SONET), the new high-speed circuit-switching technology.

SONET is undoubtedly hot. It's also arriving faster than many industry experts expected. Two user premises SONET multiplexers were announced last year, and others are being promised.

Private SONET networks have already been created at Washington, D.C.'s Metropolitan Area Transit Authority, Southern California Edison Co., Minnesota Power and some other electrical utilities — all of which use SONET gear to switch circuits on fiber-optic cables they own. Sears, Roebuck and Co. has signed up to buy SONET multiplexers, and Boeing Com-

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Users set to bring SNA data to multiprotocol backbones

Begin wrestling with technology issues involved in linking SNA devices to LAN internetworks.

By Paul Desmond
Senior Editor

Users that have built multiprotocol backbones to interconnect LANs are looking to add SNA data to those nets, but they have some options to consider first.

By adding IBM Systems Network Architecture data to multiprotocol backbones, users can eliminate the parallel networks that many currently employ — one for SNA data and another, based on bridge/routers, that links local-area networks using a variety of protocols.

A single multiprotocol backbone can provide not only savings, but greater bandwidth for SNA applications and improved routing capabilities as well. It can also simplify network management.

"One thing that's absolutely unavailable is diverse routing in an SNA backbone environment," said Chris Brown, telecommunications manager at Analog Devices, Inc. in Norwood, Mass. "That's always been a bone of contention."

Bridge/routers generally encapsulate SNA data in another protocol, such as the Transmission Control Protocol/Internet Protocol, that is more easily routed or bridged over a wide-area net. If a link fails, the bridge/router finds another without tak-

(continued on page 59)

NCR tool helps users build OLTP applications for Unix

Designed for servers in TCP/IP, OSI, NETBIOS nets.

By Jim Brown
Senior Editor

SAN DIEGO — NCR Corp. last week introduced software that will let users build distributed online transaction processing (OLTP) applications for Unix-based servers on nets supporting OSI, TCP/IP or IBM's Network Basic I/O System protocols.

The company's Top End transaction processing monitor (TPM) will enable developers and users to build applications capable of extracting and updating data from Unix data base management systems from a variety of vendors, including Ingres Corp., Oracle Corp. and Sybase, Inc. NCR will display the software at the upcoming Uniforum Conference and Trade Show in Dallas later this month.

The software will run on NCR's recently announced System 3000 line of Unix processors and eventually on systems running other Unix implementations. Top End will act as a switch that establishes and manages links between client applications and servers running DBMS software.

The package will enable NCR to compete against transaction processing giants such as IBM, Digital Equipment Corp., Stratus Computer, Inc. and Tandem Computer, Inc. said Frank Dzu-

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SNMP repeater to help fill out AT&T's Starlan lineup

By Eric Smalley
Senior Editor

SCOTTSDALE, Ariz. — AT&T is expected to bolster its Starlan local-area network lineup here this week with the introduction of several products, including an intelligent 10BaseT Ethernet multiport repeater with Simple Network Management Protocol (SNMP) capabilities.

The repeater, to be announced at the Network Users Group-AT&T conference here, will have 12 modular jacks and one attachment unit interface port, according to an AT&T source. The current 10BaseT Ethernet multiport repeater in AT&T's Starlan 10 series does not support SNMP.

The release of a 10BaseT hub with SNMP capabilities moves AT&T closer to multivendor network management.

"An SNMP hub is a smart product to do," said Michael Howard, president of Infonetics Research Institute, Inc. The concentrator's SNMP capability will enable it to be managed by other vendors' SNMP net management stations.

AT&T is also expected to provide SNMP Management Information Bases for products from other vendors.

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Briefs

Awaiting BT Tymnet's frame relay. Analysts are expecting BT Tymnet, Inc. to unveil its strategy for supporting frame relay at the Communication Network '91 show in Washington, D.C., which will take place Jan. 28 to 31. A BT Tymnet spokesperson would not confirm the reports but said the company will unveil its broadband strategy for the '90s.

US Sprint feels the fiber pain. Only three days after AT&T suffered a debilitating fiber cut that affected New York City, US Sprint Communications Co. was hit with a fiber cut outside of Albion, Ind. The outage occurred Jan. 7 at about 9 a.m. when crews trying to control local flooding cut a cable. Two hours later, US Sprint was still blocking 50% of the calls to Fort Wayne, Ind. The cut knocked out two T-3s and six T-1s on Sears Technology Services, Inc.'s private net, forcing the company to reroute traffic around the outage, said Gerald Weis, the firm's senior vice-president. Full service was restored shortly after 3 p.m. that day.

User Alliance meeting planned. The User Alliance for Open Systems will hold its first major conference March 12 to 14 in Dallas, where approximately 100 executives, many from Fortune 500 companies, are expected to attend. The alliance, which recently joined the Corporation for Open Systems International, will discuss strategic efforts, such as education and lobbying, to overcome barriers to open systems.

MCI lands pact with Japanese bank. MCI Communications Corp. last week said it has struck a three-year, $1.3 million deal to supply Japan's Kyowa Bank with an international network under its Commax facilities management service. MCI will supply the bank with a turnkey network carrying voice, data and facsimile traffic between locations in Chicago, London, Los Angeles, New York and Tokyo.

DEC resorts to layoffs. Unable to reduce its work force sufficiently through voluntary means, Digital Equipment Corp. last week said it will dismiss 3,500 workers by June 30 in the company's first layoffs ever. To cut costs, DEC launched a voluntary severance program last year, hoping to pare its work force to less than 120,000 employees. But only 2,500 of the 6,000 eligible workers accepted the offer, trimming the work force down to about 123,500 employees. Unlike the voluntary leave program, the layoffs are not expected to result in any new charges against DEC's earnings.

Backup is good business. Nynex Corp. is set to reveal its plans for making private nets in New York City far more fail-safe. The news is likely to emerge following New York Telephone Co.'s application to tariff a new service called Hotline Virtual Private Line Service. The service is meant to replace automatic voice ring-down circuits. The service is supported by a new fiber net connecting eight major private-line switching nodes. If individual links go down, data can be transmitted over different paths. That net will also support a Switched Multimegabit Data Service expected to be announced late this year or in early 1992.

Car rental outsourcing. National Car Rental System, Inc. last week announced it will hand over management of its computer systems and 1,000-node, nationwide network to Electronic Data Systems Corp. (EDS) under a 10-year, $500 million contract. By the terms of the agreement, EDS will market several strategic information systems developed by Minneapolis-based National. These include a state-of-the-art reservation system and an automated car pickup system, called SmartKey, that works much the same way as an automated teller machine. The agreement also involves the transfer of 200 National employees to EDS.

Martin Marietta reorganizes. Martin Marietta Corp. has reorganized its Information Systems Group (ISG), a move that will result in the elimination of about 400 jobs during the next several months. The Bethesda, Md.-based aerospace company said four ISG units will merge with the company's Electronics & Missiles Group in Orlando, Fla., to form the Electronic, Information & Missiles Group. Another unit will be integrated into the company's Astronautics Group in Denver. One analyst said the reorganization will give Martin Marietta short-term savings of more than $40 million.

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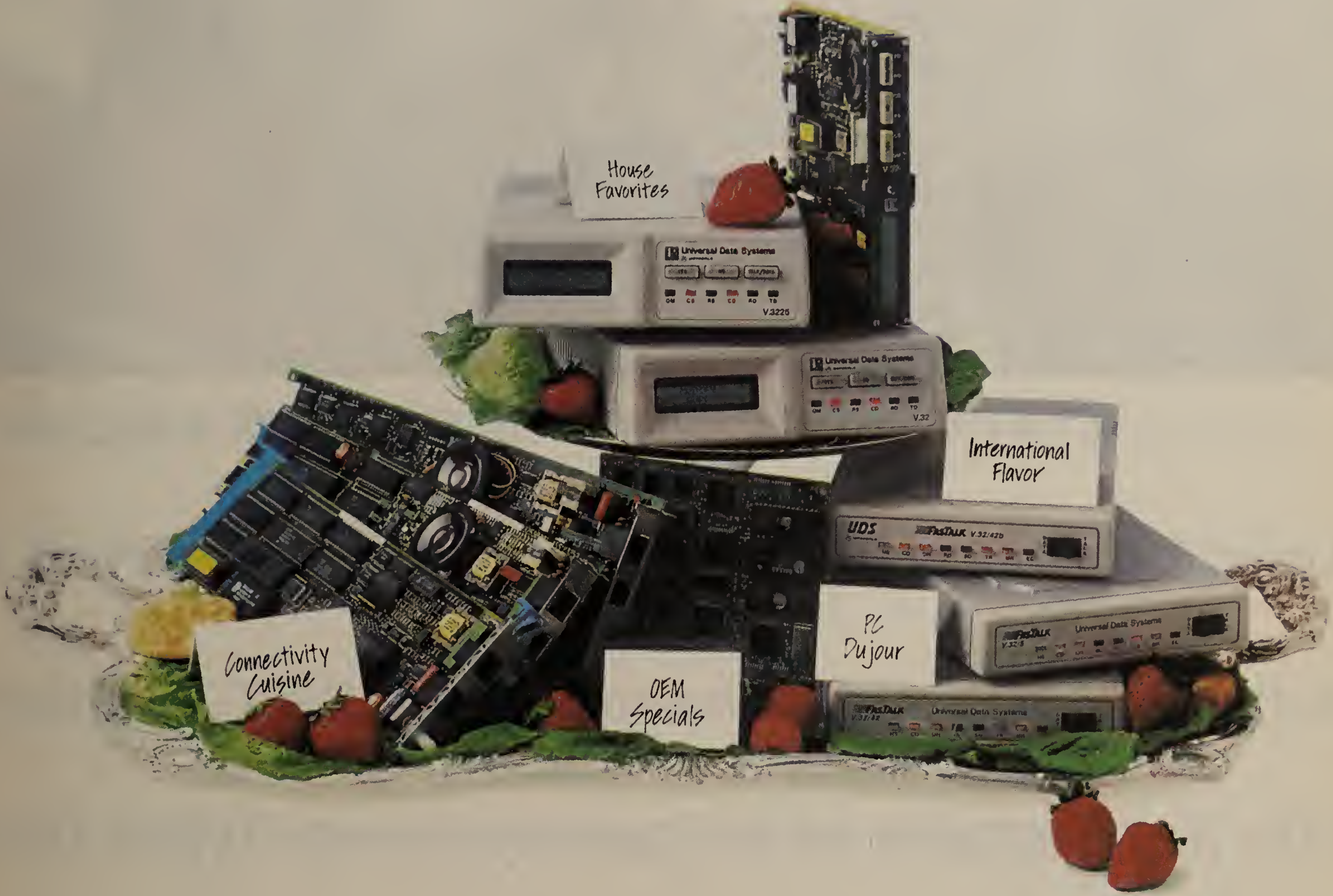
V.32 Smorgasbord



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Wang intros OPEN/image for NetWare

By Jim Brown
Senior Editor

LOWELL, Mass. — Wang Laboratories, Inc. said it will introduce this week a version of its OPEN/image software that brings image processing capabilities to LANs based on Novell, Inc.'s NetWare 386 Version 3.1.

Wang's OPEN/image for NetWare is a set of tools to build client/server applications that let local-area network-attached microcomputers access images on an optical disk drive linked to a NetWare server.

> The product is being beta-tested at Shearson Lehman Brothers, Inc. in New York.

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The product is being beta-tested at Shearson Lehman Brothers, Inc. in New York and is expected to be generally available next month. Shearson Lehman is committed to developing image processing applications to reduce the paperwork flowing throughout the company, said Ira Morrow, the firm's vice-president of technical planning.

OPEN/image for NetWare's server software, which is implemented as a NetWare Loadable Module, provides image filing, document management and printing services for microcomputers running OPEN/image for NetWare client software. The client software uses Netwise, Inc.'s remote procedure call technology and Novell's Internetwork Packet Exchange/Sequenced Packet Exchange (IPX/SPX) to give DOS or Microsoft Corp. Microsoft Windows applications access to those services.

For example, the client software requests an image from the server, which searches for the image and downloads it. If the user wants to print a copy of the image, the client software ships a request to the server, which invokes commands needed to print the image.

Storing images on a LAN server also enables mutliple users to view the image simultaneously, Morrow said. This is one of the capabilities that is attracting Shearson Lehman to the technology.

In the company's beta test, remote sites scan new customer account forms and ship the digitized images via a 64K bit/sec fractional T-1 circuit to a server running OPEN/image for NetWare in New York. Local users retrieve electronic copies of the image over a 16M bit/sec token-ring network in order to make sure it was filled out properly and that the customer's proposed investment strategy does not violate securities trading regulations.

This can speed up the time for approving new customers since headquarters no longer has to wait for new customer forms to arrive by mail, Morrow said.

Although compressed image files of roughly 40K bytes are being shipped around the LAN, Morrow said, image traffic is not yet stretching the limits of his LAN's bandwidth. However, he anticipates that as traffic grows and as

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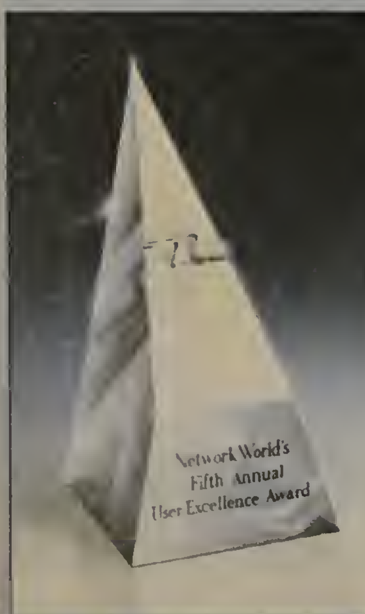
Network World to honor award winners at ComNet

Network World announced last week that it will present its 1990 User Excellence Awards during a special ceremony after the keynote address at the upcoming Communication Network (ComNet) '91 conference in Washington, D.C.



Award winners American Airlines Decision Technologies, Inc. of Dallas and First National Bank of Maryland of Baltimore will receive awards. Runner-up companies will also be honored. *Network World's* User Excellence awards are given to recognize outstanding achievements in creating strategic networks.

The ceremony will take place Jan. 30 at 9:30 a.m. in the Ramada Renaissance Techworld. The keynote speaker is Paul Stern, Northern Telecom, Inc.'s chairman and chief executive officer.

FCC closes loophole in its price cap plan for AT&T

By Anita Taff
Washington Bureau Chief

WASHINGTON, D.C. — The Federal Communications Commission last week voted to close a loophole in AT&T's price cap plan that enabled the carrier to use promotions to target certain customers for discounts while raising rates for others.

The FCC decision, which came 18 months after AT&T's price cap plan took effect, was in response to several pending protests about the new regulatory system.

The FCC also made other minor changes to AT&T's price cap system last week but refused to adopt any substantive changes requested by user groups and carriers.

In addition, the commission refused to reconsider its decision to implement price caps for AT&T.

User groups and carriers had asked the FCC to reconsider a number of major areas of the plan, including pricing flexibility, limits on AT&T's ability to lower prices and the "productivity factor," which determines how far below inflation carriers must hold future rate increases.

Price cap regulation puts a ceiling on the rates a carrier can charge instead of limiting profit levels as was done under rate-of-return regulation.

To guard against wild price swings or cross-subsidies between services, the FCC segmented AT&T services into three pricing categories, or baskets, each with its own cap. Additionally, prices for individual services within each basket are subject to bands, which prevent rates from being raised or lowered by more than 5% annually.

Despite these safeguards, users have complained that price cap regulation will prevent rates from falling as fast as they would have under the rate-of-return regulatory system.

FCC officials last week conceded that AT&T, through the use of promotional discounts, has been

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AT&T shifts sales force to focus on low-end accounts

Carrier plans to transfer about 1,000 account reps.

By Bob Wallace
Senior Editor

BASKING RIDGE, N.J. — AT&T last week said it is reorganizing its Business Communications Services group and is reassigning some national account representatives and support staff to its low-end Commercial Accounts group in an effort to increase its presence in that market segment.

AT&T is shifting about 1,000 national account representatives and transferring some of their support staff to the sales group, and will dismiss the remaining support staff, according to AT&T sales representatives interviewed by *Network World*.

AT&T would neither disclose the actual number of national account representatives to be reassigned nor comment on reports of support staff layoffs.

"The point is to create a greater presence with customers in that segment. There are millions of accounts and huge growth in this market, and that's where we want to be," an AT&T spokesman said. Some of the AT&T national account sales representatives have already informed their customers of the changes. AT&T customers say they expect to feel the effects shortly.

"We expect to experience the changes within a month," said Daniel Gonos, store systems manager for Domino's Pizza, Inc. in Ann Arbor, Mich. "It's never comfortable when you have to change account people because it takes new people some time to learn your business and how it operates."

AT&T customers may not receive the changes well, Gonos added. "AT&T has to be concerned about customer sensitivity to these types of changes. Users spend a great deal of time building solid working relationships with their account teams and don't like to see them go."

FTS 2000 enters third year facing a few new challenges

By Ellen Messmer
Washington Correspondent

WASHINGTON, D.C. — As the Federal Telecommunications System (FTS) 2000 begins its third year, the challenge of satisfying military users and improving FTS 2000 billing and network interoperability loom as key issues.

A contentious issue in the huge 10-year FTS 2000 contract has been the refusal by the Department of Defense to purchase FTS 2000 telecommunications services.

The General Services Administration's original plans for FTS 2000 envisioned the net being provided by one vendor and being used by civilian agencies.

The Department of Defense had opposed joining FTS 2000, saying it could not satisfy military requirements.

Congress, however, stepped in during 1988 and decreed mandatory use of FTS 2000 for the Defense Department as well as civilian agencies. Congress also reshaped FTS 2000 into a two-vendor contract award.

In December 1988, the GSA split the estimated $25 billion contract between two vendors. A 60% share went to AT&T, and 40% went to US Sprint Communications Co.

The Defense Department continued to balk after the contract was awarded but the GSA finally announced a truce in 1990.

The Defense Department agreed to begin ordering services, with the Defense Commercial Communications Office (DECCO) as the military's contact point, and GSA assured the department that command and control functions would remain strictly a Defense Department procurement matter.

Although the entire Department of Defense was assigned to AT&T originally, the GSA last December reshuffled assignments to balance the contract because the U.S. Postal Service and the Tennessee Valley Authority had (TVA) voluntarily joined FTS 2000.

AT&T was assigned the Postal Service, TVA, Office of the Secretary of Defense, the Army and the Air Force, while US Sprint picked up the Navy.

Gary Foresee, president of US Sprint's government services division, last week said Navy orders would likely reach $160 million under FTS 2000, but he added

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Correction: The editorial "A few thoughts about New Year's resolutions" (*NW*, Dec. 31/Jan. 7), incorrectly listed the contact number for the Corporation for Open Systems International (COS). Anyone wishing to contact COS for information regarding the User Alliance for Open Systems should call Marshall Cain at (703) 883-2726.

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General DataComm

FTS 2000 facing new challenges

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that the Navy has yet to place an FTS 2000 order.

Both US Sprint and AT&T admit that firm figures for military use are difficult to predict.

"When it comes down to defining potential traffic on FTS 2000, it's been hard to get our arms around it," said Kim Davenport, AT&T's sales and marketing manager for FTS 2000. "We need to know that from a network engineering standpoint as well as a revenue-planning standpoint."

Davenport said DECCO plans to deliver in the near future a forecast of the military's use of FTS 2000.

The Army and Air Force recently placed their first orders with AT&T, totaling $4 million for 1990. The McClelland Air Force Base in Sacramento, Calif., was the first of seven Air Force locations AT&T cut over before Christmas for its WATS and 800 services. AT&T said it expects to cut over 50 more sites by February.

Orders from 57 Army bases in the U.S. have been placed for voice services as well as 9.6K and 19.2K bit/sec analog data circuits for Army administrative access to data bases.

But the largest Army order has been a T-1 backbone network for the Army Corps of Engineers that links 100 locations nationwide. Davenport said the network, to be completed by February, would enable Army engineers to transfer graphics and routine administrative data.

Both vendors acknowledge that the military will be a tough customer because it can bypass the FTS 2000 mandatory-use requirement far more easily than civilian agencies.

For all 1.2 million FTS 2000 users, billing has been troublesome. To date, each agency's bill has reflected approximate usage, a system disliked by agency telecommunications managers handling budgets.

The GSA intends to move to a new billing system reflecting actual use, but the problem is that several agencies frequently share the same private branch exchange, which is often incapable of differentiating usage at each call station, said Mike Corrigan, assistant commissioner for the Office of Telecommunications Services in the GSA.

"Call-detail records are now associated with the trunk group," Corrigan said. But in April, the GSA will begin six-month trials with both AT&T and US Sprint to use Integrated Services Digital Network Primary Rate Interface and automatic number identification features to collect calling-party billing information.

The AT&T trials are scheduled for the GSA's Boston location, where an AT&T Definity PBX owned by the GSA will collect data from about 30 Department of Agriculture and Peace Corps employees.

Similar trials are scheduled by US Sprint for GSA locations in Auburn, Wash., and Kansas City, Mo.

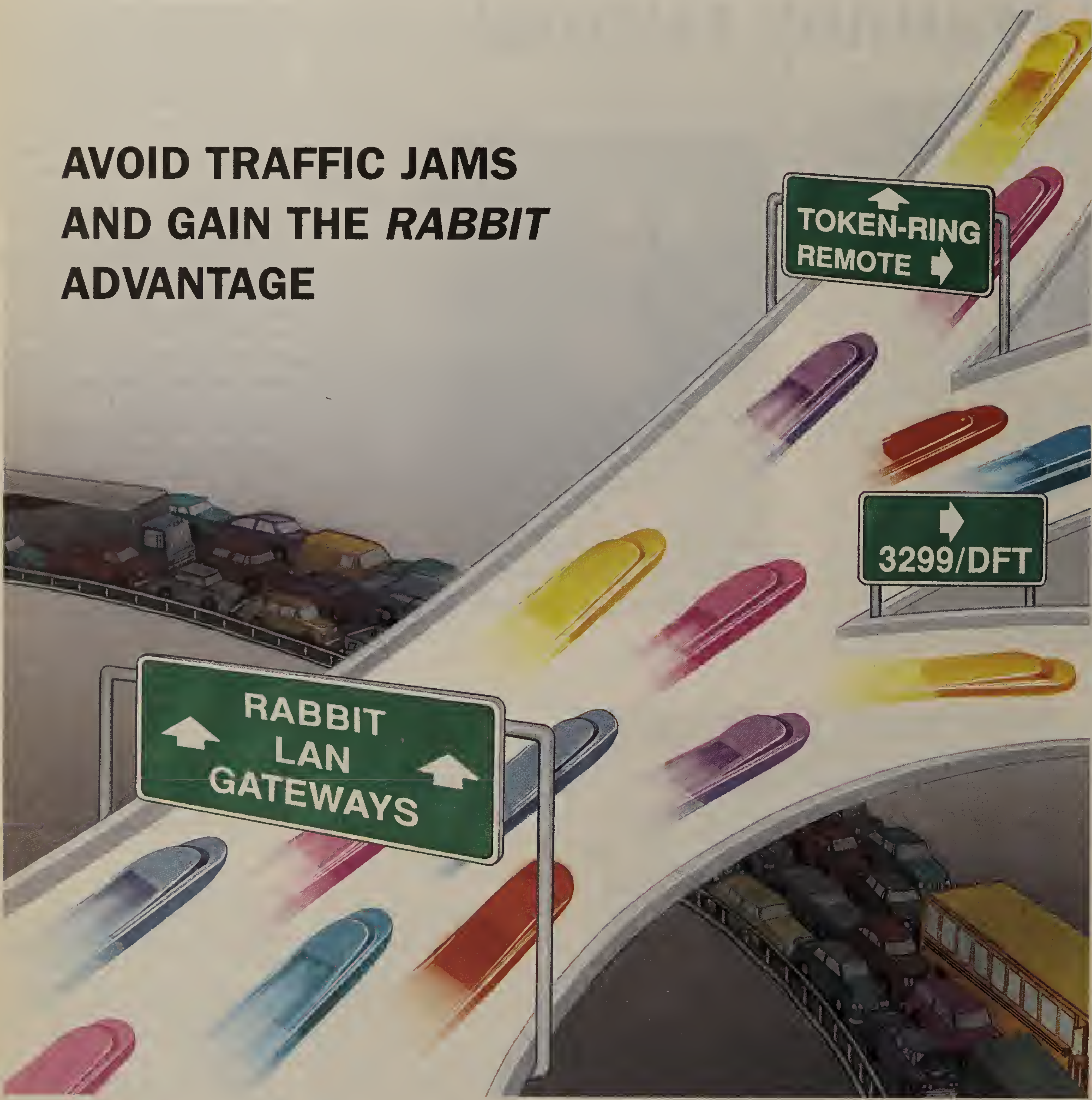
Video links

Corrigan said the GSA recently ordered a 12-room videoconferencing system on a trial basis from US Sprint. If the pilot program is effective, GSA will seek bids for videoconferencing equipment because FTS 2000 does not include equipment acquisitions.

In 1991, GSA will push AT&T and US Sprint on the interoperability issue by negotiating with the two vendors on a price to interconnect their respective FTS 2000 videoconferencing services at two or three locations nationwide, something not yet achieved in the private sector.

Corrigan said he will also seek interconnectivity of the two vendors' packet-switched networks. During 1990, both networks' voice cutover was completed, but cutover of data is just beginning.

"Data's warming up. Interoperability is important," emphasized Corrigan, who said the GSA wanted agencies on the two networks to be able to exchange data. Corrigan said the FTS 2000 contract requires the two winners to sit down and make interoperability work. ◼



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INDUSTRY UPDATE

VENDOR STRATEGIES, MARKET TRENDS AND FINANCIALS

Worth Noting

> "One of the most dramatic trends within the terminal server arena has been the increasing proclivity of vendors to position terminal servers as communications servers."
>
> **Susan Frankle**
> Analyst
> International Data Corp.
> Framingham, Mass.

People & Positions

Bytex Corp. last week announced the resignation of **Jeffrey Goodman,** the company's president and chief executive officer.

Goodman has reportedly accepted the position of president and CEO at a company affiliated with a major customer of Bytex.

Meanwhile, Bytex has appointed **Arthur Carr,** an independent consultant, as acting president and CEO while the company conducts a search for a permanent successor.

Carr is reportedly a candidate for the position.

Bytex is a Southborough, Mass-based manufacturer of matrix switches and local-area network products.

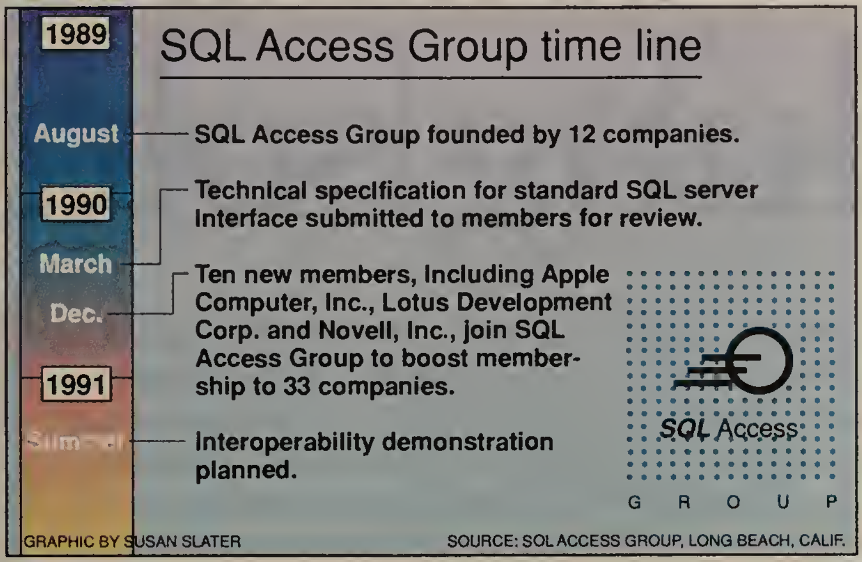
Mitel Corp., a Kanata, Ontario, maker of telecommunications equipment, last week announced that **John Jarvis** has resigned as the company's president and chief executive officer to pursue other interests.

The company's board of directors has appointed **Anthony Griffiths** as Jarvis' replacement, effective immediately.

Griffiths, who is currently the company's chairman, held the positions of president and CEO before Jarvis was appointed.

Avanti Communica-

(continued on page 12)



GRAPHIC BY SUSAN SLATER

SOURCE: SQL ACCESS GROUP, LONG BEACH, CALIF.

SQL Access Group preps for interoperability demo

Members to display wares supporting new spec.

By Bob Brown
Senior Editor

LONG BEACH, Calif. — The SQL Access Group is gearing up for a product demonstration this summer designed to highlight group members' progress in building interoperable SQL applications and data base management systems.

The SQL Access Group last spring developed a specification that defines how applications on client workstations can access SQL-based data base engines from a variety of vendors. Now group members are working to build support for the specification into SQL client applications and relational DBMSs that will be showcased at the upcoming demo.

The SQL Access Group is a consortium of vendors and one user dedicated to developing a standard way for SQL applications and data bases from different vendors to be mixed and matched in corporate networks. Although SQL is a standard, vendor implementations of SQL differ enough so that one vendor's SQL client may not be able to access data in other vendors' SQL data bases.

The demonstration, originally scheduled for early summer, will probably take place later in the season due to some delays in building the SQL Access Group specification into prototype products, group members said.

Even so, some vendors could have products available later this year that incorporate the specifications or options based on them.

"For the vision of the network to be fulfilled, users will have to be able to get access to any data base on the network with equal ease," said Roger Sippl, chairman of the SQL Access Group and member company Informix Software, Inc. "The demonstration will be a step in that direction."

The demo will likely feature products from some of the SQL Access Group's founders, including Digital Equipment Corp., Informix, Oracle Corp. and Hewlett-Packard Co.

The SQL Access Group entered 1991 with great momentum. It recently signed on 10 new members, including Novell, Inc. and Apple Computer, Inc., bringing its total membership to 33 companies ("Firms join effort for SQL data base compatibility," *NW,* Jan. 7).

Roger Sippl

"We're not yet a proven group," acknowledged Jeffrey Balboni, chairman of the group's technical committee and a data base systems interoperability consultant at DEC in Nashua, N.H. "But we think the new members have given us the critical mass needed, and the interoperability demo should really make people stand up and notice us."

Some observers have been skeptical about the SQL Access Group from the start, describing the effort as a way for vendors to temporarily placate users concerned about interoperability.

"It's a publicity stunt," said Richard Finkelstein, president of Performance Computing, Inc., a data base consulting firm in Chi-

(continued on page 12)

Vendor views vary on dual-use routing

Several internetworking vendors are questioning need for IETF's Integrated IS-IS routing protocol.

By Ellen Messmer
Washington Correspondent

WASHINGTON, D.C. — Internetworking vendors are divided on the importance of the new dual-use routing protocol for Transmission Control Protocol/Internet Protocol and Open Systems Interconnection networks.

Several vendors said they plan to support the Integrated Intermediate System to Intermediate System (IS-IS) protocol but disagreed on how much user demand exists for it.

The Internet Engineering Task Force, the informal standards body for the Internet community, recently released Integrated IS-IS, a routing protocol developed by Digital Equipment Corp. that supports transmission of both TCP/IP and OSI packets across the same network.

While Integrated IS-IS could provide TCP/IP users with a migration path to OSI, some vendors expressed doubt about whether their customers really want a dual-use routing protocol. Some say OSI and TCP/IP users are two separate camps and that users have so far shown little interest in combining OSI and TCP/IP traffic.

Wellfleet Communications, Inc. is targeting the fourth quarter of 1991 for release of an Integrated IS-IS router. But a higher priority for the company is availability of a fully OSI-compliant IS-IS router to be shipped at an unspecified date this summer.

> Some vendors doubt whether their customers really want a dual-use routing protocol.
>
> ▲▲▲

The IS-IS routing protocol is based on International Standards Organization (ISO) draft standard DIS 10589, expected to be

(continued on page 12)

INDUSTRY BRIEFS

General DataComm, PEER to comarket gear. General DataComm, Inc. and PEER Networks, Inc. last week announced a joint marketing agreement under which the two firms will make joint sales calls to offer users a variety of network equipment.

The vendors will target the airline, banking, brokerage, insurance and other industries that rely on high-speed transaction-processing networks. PEER Networks and General DataComm said they will provide users with integrated network management. Both companies' network management products run on Sun Microsystems, Inc. workstations.

General DataComm is a Middlebury, Conn., manufacturer of multiplexers and other network gear. PEER Networks is a start-up firm in Santa Clara, Calif., that makes net controllers.

AT&T increases stake in Sun. Sun Microsystems, Inc. last week said it will sell 491,755 newly issued shares of common stock to AT&T for about $13.7 million to give AT&T about a 20% stake in the workstation maker.

Under a recently expired contract, Sun was permitted to sell to AT&T newly issued shares amounting to as much as 15% of Sun's total outstanding shares. The agreement also gave AT&T the right to buy an additional 5% of Sun stock on the open market. Sun had 97 million shares outstanding as of June 30, 1990.

Digital Sound trims down. Digital Sound Corp., a Carpinteria, Calif., manufacturer of voice processing systems, last week said it will reduce its 200-member work force by 25%

(continued on page 12)

When it comes networking solutions,

Recognizing the full potential of networking is one thing—actually realizing it is another. To truly fulfill that potential, every component of your network needs to turn in a great performance. That's why IBM offers a complete range of leading-edge LAN products in the desktop networking field—giving you the broadest range of solutions available to continually advance your system's possibilities.

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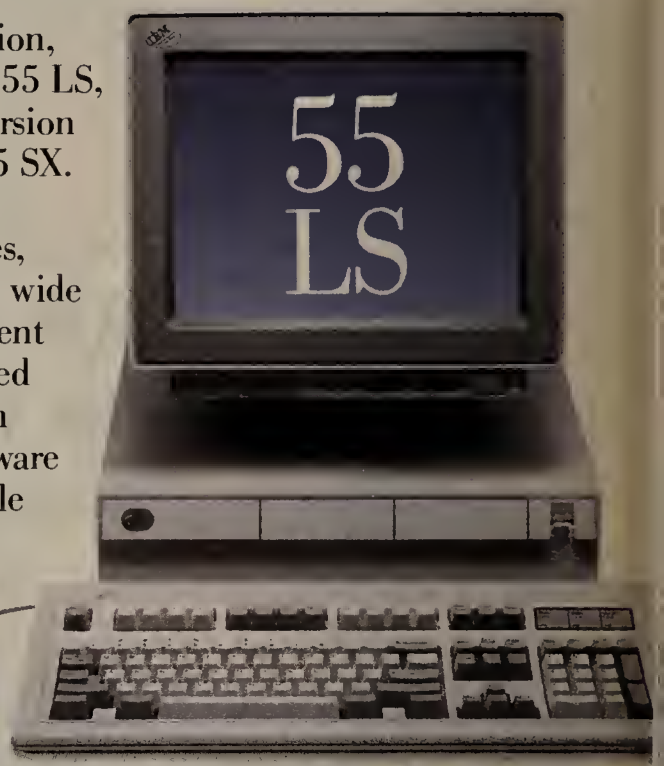
AN EFFICIENT WAY TO BRIDLE YOUR DATA.

Whatever your needs may be, IBM has PS/2s that can serve as excellent client stations. And if you want to keep a tight rein on your network's information, IBM offers the PS/2 Model 55 LS, a medialess LAN station version of the best-selling Model 55 SX. A cost-efficient alternative to models with storage drives, the Model 55 LS provides a wide array of effective management controls, including enhanced data security, consistency in software levels, central software maintenance and central file backup. Not only is the Model 55 LS easy to hook up (it comes standard with a Token-Ring Network or Ethernet adapter), but should you need to modify your system, it's easy to upgrade with diskette and file storage devices.



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to advanced IBM leads the way.

performance, less memory requirements, fewer DASD requirements and support for Adobe Type Manager™ fonts. And with support for 128 DOS requesters, LAN Server V. 1.3 can provide significant cost benefits for DOS network users. Compatibilities between IBM DOS LAN requester and the current version of Windows® 3.0 (LAN Manager 2.0 enhanced) have also been added, capping off the many ways IBM gives you greater flexibility in the LAN environment.

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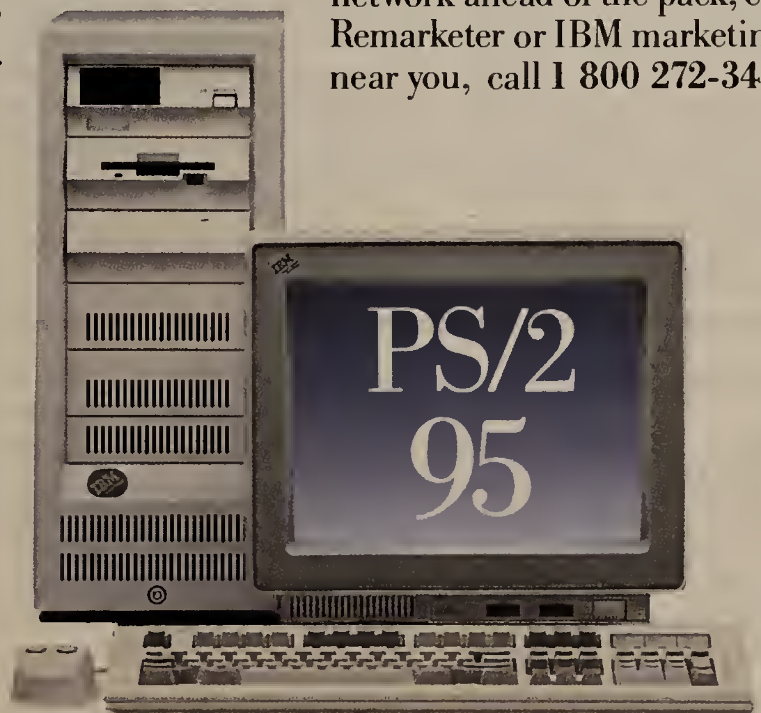
With the many components that constitute a Local Area Network, it's plain to see why a LAN is only as strong as its weakest link. That's why the IBM total LAN solution—LAN servers, workstations, networking software, printing stations and Token-Ring Network—is simply without peer: because there are no weak links. To find out how IBM can keep your network ahead of the pack, contact your IBM Authorized Remarketer or IBM marketing representative. For a remarketer near you, call 1 800 272-3438.



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Views vary on dual-use routing

continued from page 9

finalized this July. The ISO routing specification originated from a DEC proposal. According to DEC, it represents a subset of the Internet's Integrated IS-IS specification.

Karen Barton, Wellfleet's director of marketing, said the company perceives more demand for a pure ISO product than for Integrated IS-IS.

She said corporate network users generally have expertise with either OSI or IP, but not both. She questioned whether many users will adopt a dual standards strategy.

Jeff Paine, a spokesman for cisco Systems, Inc., said managing a network supporting both protocols is difficult. "It's a job for the network administrator, certainly," he said.

Cisco Systems plans to release an OSI IS-IS router in midyear and will follow up with a product that supports the Integrated IS-IS protocol at an undetermined date. But Paine said cisco Systems, which wants to make all options available to users, perceives interest in the Integrated IS-IS protocol among government and large corporate network users.

"The government is moving to OSI, and companies want international standards. So dual IS-IS makes a lot of sense," Paine said. He added that Integrated IS-IS routers would provide a lot more functionality than TCP/IP routers using the new Open Shortest Path First (OSPF) protocol.

Sharon Hume, manager of internetworking marketing at 3Com Corp., said her company will be the first to deliver an OSI IS-IS router, with release planned for February. She said the product is particularly important to European users, who have a great deal of interest in OSI.

But 3Com, which must make trade-offs based on market perceptions, does not believe there is sufficient user interest to warrant support for the Integrated IS-IS protocol at this time.

"We don't see a tremendous need from customers for dual IS-IS, but if the trend completely turns around, we could probably implement it quickly. We have to see what influence DEC has in this," Hume said, alluding to DEC's plan to incorporate Integrated IS-IS into DECnet Phase V.

Another vendor not planning to release an Integrated IS-IS router is Advanced Computer Communications (ACC). "We're not sure of the value of dual IS-IS as a transition [tool]," said Gary Krall, director of marketing at ACC. Krall pointed out that ACC's strategic alliance with British Telecommunications PLC, announced last September, was a driving force in ACC's decision to commit to OSI support for its multiprotocol 4000 series of bridge/routers.

In the fall, ACC plans to release an IS-IS router that British Telecom will market globally under its own name.

Krall said British Telecom, with its eyes on a growing OSI market in Europe, has not discussed building a dual-use IS-IS router with ACC. "Our approach is to keep the stacks relatively pure," he said.

Asher Waldfogel, Proteon, Inc.'s senior technical marketing director, said Proteon would release an OSI IS-IS router by the end of this year but will not support Integrated IS-IS unless it becomes an official ISO standard.

Waldfogel also expressed reservations about Integrated IS-IS. "The dual-stack approach forces you to make every site on the network dual-stack," he said.

Before releasing OSI or Integrated IS-IS routers, many vendors plan to release TCP/IP routers based on the OSPF protocol (see graphic, this page). Several of those introductions are planned for the first quarter of this year.

OSPF, released by the Internet Engineering Task Force, is widely viewed as the next-generation TCP/IP router protocol. Only Proteon, which authored the original specification, has an OSPF router available. But ACC, 3Com and other vendors are strongly backing OSPF.

DEC has not announced support for OSPF, but the company will embrace the Integrated IS-IS protocol. DECnet Phase V was originally conceived as a pure OSI implementation, but the company sees Integrated IS-IS as a way to serve the growing number of TCP/IP network users.

"DECnet Phase V was originally designed to be fully OSI-compliant on all seven layers," said Bill Mitchell, DEC's wide-area network marketing manager. "In the past three years, many things have changed in the marketplace. The emergence of TCP/IP as a multivendor network architecture has occurred during that time frame."

Vendor support for routing protocols

	OSPF		IS-IS	Dual IS-IS
	Current	Planned	Planned	Planned
Advanced Computer Communications	No	Yes	Yes	No
cisco Systems, Inc.	No	Yes	Yes	Yes
Digital Equipment Corp.	No	No	Yes	Yes
Proteon, Inc.	Yes	—	Yes	No
3Com Corp.	No	Yes	Yes	No
Wellfleet Communications, Inc.	No	Yes	Yes	Yes

Plans to support 3 emerging routing protocols that promote router interoperability on TCP/IP and OSI networks.

IS-IS = Intermediate System to Intermediate System
OSPF = Open Shortest Path First

GRAPHIC BY SUSAN J. CHAMPENY

SOURCE: *NETWORK WORLD*

Proposed bill sets network quality standards for LECs

By Anita Taff
Washington Bureau Chief

WASHINGTON, D.C. — Rep. John Bryant (D-Texas) has renewed his efforts to ensure that local telephone service quality will not erode as a result of price cap regulation being implemented at state and federal levels.

On the opening day of the new congressional session this year, Bryant introduced a bill that would establish network quality standards for local exchange carriers. Bryant sponsored a similar bill last year that was left hanging when Congress adjourned.

The current bill would require the Federal Communications Commission to develop quality standards and create a board of state and federal regulators to enforce them. At a minimum, the standards would set parameters for service installation time frames, call completion times, noise levels, bit error rates and customer trouble report levels.

The bill would also require the board to conduct periodic audits and issue quarterly reports on local carrier compliance.

Bryant said he is fearful that serious deterioration of service quality could result from price cap regulation, which is being implemented for some local carriers at both the state and federal levels. He also said he believes that carriers will scale back or eliminate net maintenance in order to cut costs and increase profits under price cap regulation.

"With a profit-sharing system, the carrier has the incentive to skimp on quality because it can retain all or part of the money from cost savings," Bryant said when he introduced the bill.

Not only is Bryant concerned about price cap regulation harming service quality, he said that allowing carriers to enter new business areas could have the same effect on service.

"I am concerned that as the local exchange carriers are permitted to enter into new competitive activities, [they] will focus on new ventures rather than providing regulated telecommunications services," Bryant said.

In a separate bill also introduced this month, Bryant called for a requirement that if the regional Bell holding companies were to be allowed to manufacture equipment in the future, that gear would have to be designed and fabricated domestically (see "Washington Update," page 13).

SQL Access Group prepares

continued from page 9

cago. "To change an [application program interface] is an extraordinarily difficult job and would require taking out the whole guts of their systems. No vendor is in a position to drop everything it's doing and start from scratch."

Skeptics also point to the group's inability to persuade IBM, a leading player in the relational DBMS market, to join.

But according to Sippl, IBM's absence will not cripple the organization.

He said members of the group will likely provide gateway products, based on the group's specification, that will give users access from multiple client applications to IBM's relational DBMS.

"I can assure you that IBM data bases will not be out of reach," he said.

Even without IBM, members of the SQL Access Group hold about 70% of the relational DBMS market, a spokesman for the group added.

Dwight Davis, director of product marketing for Novell's Development Products Group in Austin, Texas, said the group's mission is important to users with networks that support a variety of SQL-based DBMSs.

At this point, users have more of an "I'd like to have" attitude toward interoperable SQL data base products, he said, but they are moving toward an "I've got to have" attitude as their networks grow.

"That's what we'd like to be ready for," Davis said.

Sippl pledged that one of the group's goals this year will be to find a way to get users more involved in the organization.

Industry Briefs

continued from page 9

as part of a corporate restructuring plan.

The work force reduction comes as a result of continued sluggishness in the company's business and the general downturn in the economy, according to Digital Sound officials.

Following the theory that current economic conditions will continue for the foreseeable future, the company is trimming its work force as a measure aimed at reducing spending and conserving working capital.

AT&T, Compression Labs join forces. AT&T and Compression Labs, Inc. have announced an agreement whereby the companies will comarket videoconferencing offerings to U.S. government agencies for the Federal Telecommunications System (FTS) 2000 network.

The comarketing pact is an extension of a year-old agreement under which AT&T selected Compression Labs as the exclusive supplier of video coder/decoder equipment for AT&T's portion of the FTS 2000 network, which is believed to be the largest private communications network in the world.

Under the new agreement, AT&T and Compression Labs will coordinate the ordering and installation of video room equipment with FTS 2000 video services.

The accord will enable government agencies to work with either AT&T or Compression Labs for their end-to-end videoconferencing needs.

The new agreement is in effect through 1998.

People and Positions

continued from page 9

tions Corp. of Norwood, Mass., recently announced the appointment of **Peter Gladding** as director of distribution sales.

Gladding, who earlier served as Avanti's distribution manager for the East Coast, will seek to establish OEM relationships with suppliers for Avanti's line of T-1 network equipment in the U.S. and Canada.

The position of East Coast distribution manager has not been filled.

Gladding replaced **Ron Martin,** who left to pursue outside interests.

Avanti is a manufacturer of a wide line of equipment, including channel service units, multiplexers and local-area network bridges.

TELECOMMUNICATIONS

CARRIER SERVICES, CENTREX, CPE, WIRING SYSTEMS AND BYPASS

Worth Noting

AT&T Bell Laboratories last week announced that it has developed a laser smaller than a dime that is capable of generating 350 billion light pulses a second. The fastest lasers used in networks today generate only 2.5 billion pulses per second. The high-speed laser may eventually be used to increase the traffic capacity in AT&T's fiber-optic network transmission systems.

Carrier Watch

Northern Telecom, Inc. last week said that **Carolina Telephone & Telegraph**, a subsidiary of United Telecommunications, Inc., has become the first independent telephone company to install the switch maker's Automated Alternate Billing Services (AABS) system.

The system, which uses voice processing technology in place of live operators to process collect, credit card and third party-billed calls, is installed at Carolina Telephone's Rocky Mountain, N.C., office.

AABS uses voice prompts to ask callers to enter digits that correspond to the requested service. For third-party and collect calls, the system calls the party to be billed and asks if the charges will be accepted. The billed party must answer yes or no, or request an operator. Depending on the response, the system either completes the call, informs the calling party that the charges have been refused or connects the party to an operator.

AABS is designed for use with Northern Telecom's Traffic Operator Position Systems, the vendor's integrated operator workstations.

Expected rise of the ACD market

	Millions of dollars	
	1990	1995
Stand-alone ACDs	$2,609.0	$3,860.0
PBX-based ACDs	372.0	600.0
ACD software*	67.5	121.6
Centrex ACD service	10.0	46.1

* Includes ACD/MIS software, which runs on external processors and generates a variety of management reports from stand-alone and PBX-based ACDs.

ACD = Automatic call distributor

GRAPHIC BY SUSAN J. CHAMPENY

SOURCE: FROST & SULLIVAN, INC., NEW YORK

Off-tariff prices, custom nets throw off net designs

Users must monitor changes to get best deals.

By Daniel Briere
Contributing Editor

The prevalence of custom network deals and off-tariff pricing is giving network designers headaches. Lack of definitive pricing and known discount rates can throw off even the most sophisticated network design programs.

"We're definitely seeing subtle changes in the manner in which customers perform network analysis," explained Ed Garner, director of The Aries Group/MPSG, a network analysis firm in Rockville, Md.

"Before, customers used to come to us for information about what to order. We would perform the network analysis based on their call data and provide them with a listing of circuits that they would order from their local and long-distance carriers. Now our analyses are used more for preparation of initial bidding documents," Garner said.

The lack of definitive pricing is not, however, stopping the network design process. Far from it.

Network designers argue that customers need to identify what equipment and services they have before asking carriers to bid on their networks. "Users need to identify where the pressure points are and where they can push the carrier for greater discounts or flexibility," Garner said. "That can only be done if you know what your network looks like to begin with."

A widespread network analysis and accompanying consultation for a three- to four-million minute network can cost users about $150,000 to $200,000, according to Garner. "This is peanuts compared with the savings that a proper analysis can provide. Customers need to develop their own cost curve before seeking competitive bids.

Users that do not perform upfront analyses risk losing control of the bidding process. "The user that puts all of his or her trust in the carrier to perform the network analysis won't have a job for long," Garner said. "Carriers push users into the services they are stressing at that time."

One of those services happens to be virtual networks. "The pricing is hard to beat. Private network solutions are getting harder to justify," Garner said.

> Users that do not perform analyses risk losing control of the bidding process.

▲▲▲

The advent of virtual networks as an all-encompassing long-distance service also changes some of the fundamental private network design tenets popular just a few years ago.

One such belief, for example, involves network segmentation — breaking up a network into component parts to increase the range of options for those parts. If a user were to request bids on a worldwide private-line network, the number of individual vendors capable of delivering such a net-

(continued on page 15)

Briere is president of TeleChoice, Inc., a Montclair, N.J., telecommunications consultancy specializing in long-distance service analysis and network design.

AT&T, Sprint offer virtual net incentive

Carriers give new customers of SDN and VPN onetime $10,000 credits on international calling.

By Bob Wallace
Senior Editor

AT&T and US Sprint Communications Co. are trying to lure customers to their virtual network services by offering users that commit to the services a onetime maximum $10,000 credit on international calling.

The two carriers each proposed international calling promotions as customers celebrated Christmas Eve. The Federal Communications Commission approved the plans Jan. 4. MCI says it currently does not plan to offer such a promotion.

The promotions are the latest steps in a fast escalating marketing war for prospective virtual network customers. Fierce competition among the Big Three carriers has forced them to take drastic measures, including selling virtual net services to single-site users.

"AT&T and US Sprint realize that a large number of companies will decide in the next several months whether or not to expand into global markets," said Jeffrey Close, president of Tri-Quad Enterprises, a Glastonbury, Conn., consultancy. "Each wants to be their virtual network provider. The $10,000 credit is a nice incentive for prospective users."

AT&T launches SDN promotion

SDN EVPPs covered

Option (4-year term)	Minimum annual usage (millions of minutes)
II	2
III	50
IV	200
V	10
VI	15

The maximum volume discount for SDN international traffic is 16%. EVPP Option I is not covered in the promotion.

EVPP = Expanded Volume Pricing Plan
SDN = Software-Defined Network

SOURCE: AT&T, BASKING RIDGE, N.J.
GRAPHIC BY SUSAN J. CHAMPENY

Under the AT&T promotion, users that sign up for Software-Defined Network (SDN) service between Jan. 4 and Feb. 4 for in-

(continued on page 15)

WASHINGTON UPDATE

BY ANITA TAFF

Lawmakers wrestle with MFJ ruling. The question of whether the regional Bell holding companies should be freed from business restrictions contained in the Modified Final Judgment surfaced on the first day of the new congressional session earlier this month. But despite the early start, it appears that lawmakers are far from resolving this issue.

Rep. John Bryant (D-Texas) introduced a bill mandating that if the manufacturing restriction is lifted, the RBHCs would be required to do all planning, design and fabrication in the U.S. Although Congress has not decided whether the RBHCs should be allowed to manufacture telecommunications equipment, this bill conflicts with earlier proposals.

Last year, Sen. Ernest Hollings (D-S.C.) introduced the first bill on the Modified Final Judgment restrictions that ever made it to the floor. That bill would have allowed the RBHCs to manufacture equipment if at least 60% of the work was done domestically. Although the bill was left pending and died at the end of the congressional session last year, observers say the only reason the bill got as far as it did was that Hollings made concessions on it. Initially, Hollings wanted to require the RBHCs to manufacture 100% of equipment, including components, in the U.S. But after the bill was criticized as protectionist by the RBHCs and the Bush administration, Hollings weakened the domestic manufacturing requirement.

"Today, not one residential telephone instrument — the device pioneered by Alexander Graham Bell — is manufactured by an American company in the U.S.," Bryant said when he introduced the bill.

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AT&T, Sprint offer incentive

continued from page 13

stallation before Aug. 1 will receive a maximum $10,000 credit on international usage for their first SDN bill. Users must enroll in one of the carrier's Expanded Volume Pricing Plans (EVPP) to receive the credit (see graphic, page 13).

Edward Reilly, product manager with AT&T's International Communications Services group, said the promotion will act as an incentive for its current WATS users and users of its competitors' offerings to move to SDN. Reilly declined to say what the promotion will cost AT&T or how many new SDN customers it will help AT&T land.

International calling is a standard feature with SDN and enables users to place off-network calls to sites in 177 countries. SDN international rates are 30% to 40% below rates for international direct-dialed calls, he said.

SDN's international feature should not be confused with Global SDN, a service that enables users to build virtual networks of domestic and international sites. Global SDN supports such standard SDN features as seven- and 10-digit dialing plans, account codes and authorization codes. The service is designed primarily for calls between on-network locations and is only available to Australia and the U.K.

The US Sprint promotion is almost identical to AT&T's. Users that sign up for the carrier's Virtual Private Network (VPN) service between Jan. 4 and Feb. 4 will receive a maximum $10,000 credit on international usage for their first VPN bill. VPN enables users to place off-network calls to sites in 163 countries.

The difference is that US Sprint's promotion is only for new VPN customers, while AT&T's offer is open to current SDN customers that have not previously committed to one of several minimum annual usage levels provided for under the carrier's EVPP.

In addition to bringing fence sitters aboard SDN, AT&T hopes the promotion will help truncate the SDN sales cycle. Typically, it takes two months from the time AT&T first contacts the user to propose SDN until the time the customer signs on the bottom line, Reilly said.

"Our rationale behind the promotion was to offer users in the sales cycle an attractive incentive to move to SDN and move quickly," Reilly said.

But the effectiveness of the measure may be limited as US Sprint has implemented a similar promotion.

AT&T also said that most current SDN users are ineligible for the promotion. The carrier fears that current SDN customers that do not qualify for the promotion might discontinue service and resubscribe to cash in on it. ◻

Off-tariff prices throw off plans

continued from page 13

work would be extremely limited.

By dividing the bid into many different parts, such as domestic vs. international, the user is able to find a larger base of providers. In the past, users that were able to create more generic components had more power to choose among a range of suppliers.

However, these tenets are changing. Long-distance carriers are offering more value-added services to prevent customers from shopping around. As users flock to virtual network services for the total solution, the number of potential bidders shrinks again. In the domestic virtual network environment today, there are only three vendors — AT&T, MCI Communications Corp. and US Sprint Communications Co.

"Unified bills, better chargebacks, unified network management and single point of contact make single-vendor virtual networks quite attractive for a customer's network," said Tom Walton, president of Walton and Walton Associates, Inc. in Richmond, Va. "The carriers are positioning themselves to assume more of a user's long-distance services under a single switched virtual net." ◻

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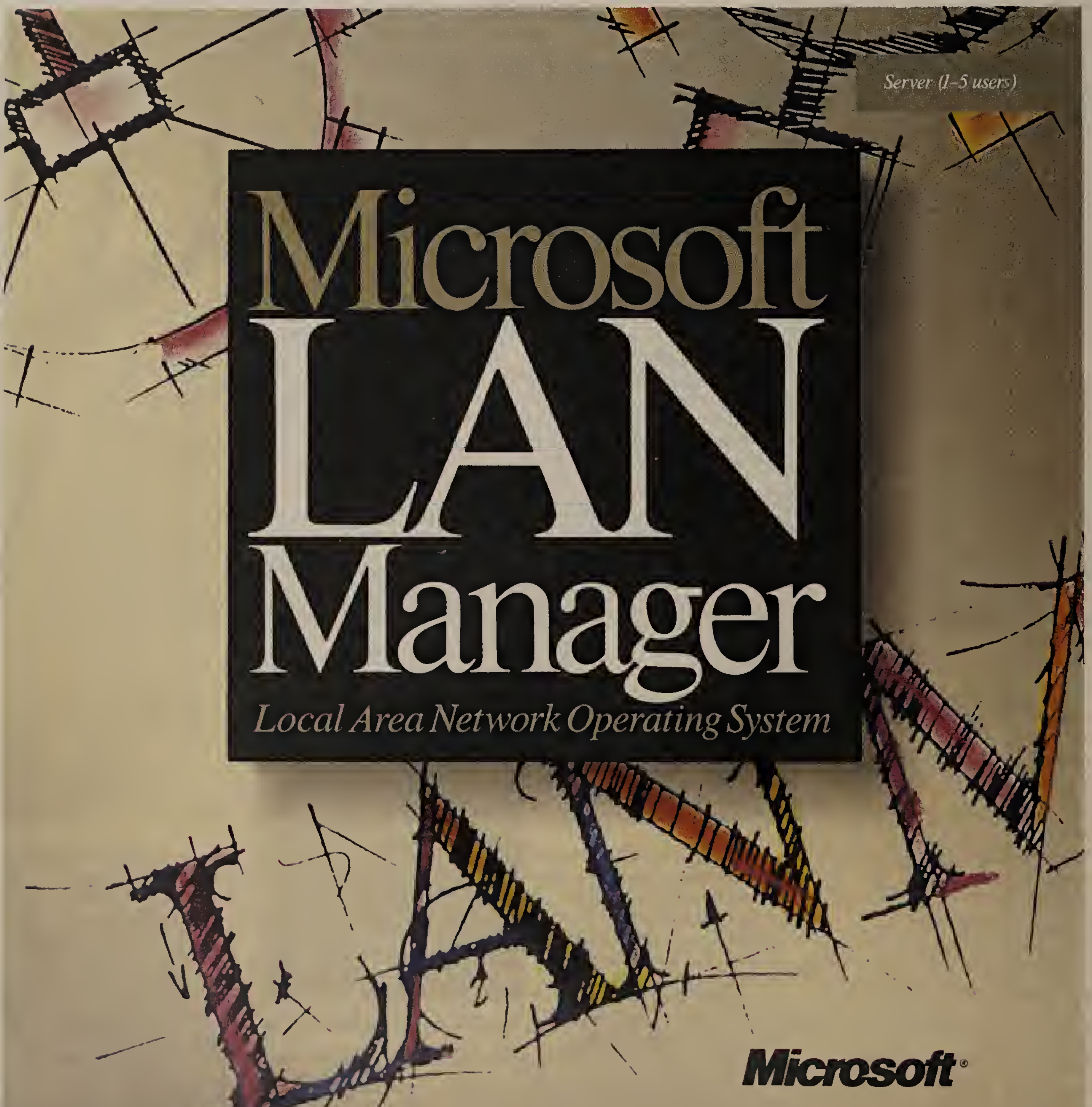

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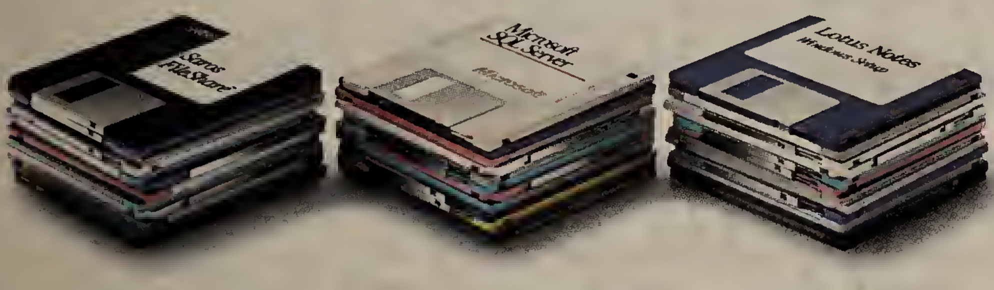

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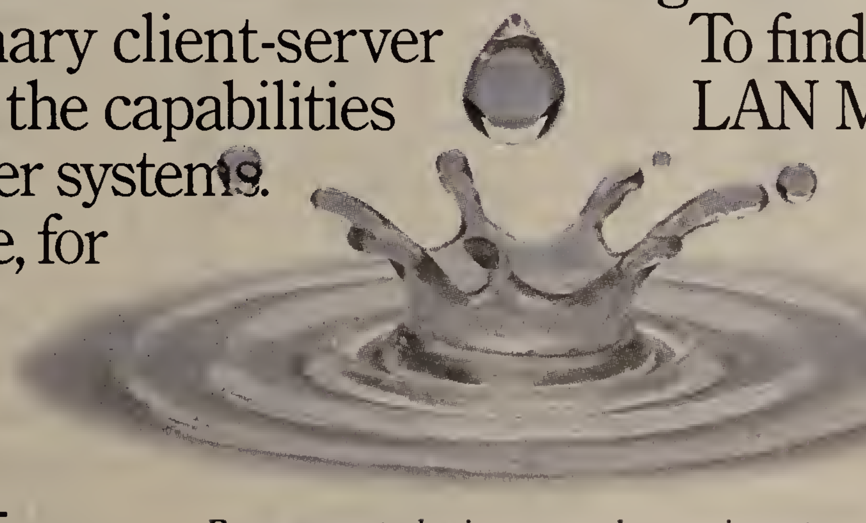

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Which V.32 Modem Is The Most Intelligent Buy? Ours Tops The Chart.

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PC WEEK High-speed Modem Product Review / November 19, 1990

PC WEEK LABS — ANALYST'S SCOREBOARD

	Digicom Systems Inc. 9624LE+	Hayes Microcomputer Products, Inc. Hayes Ultra 96	Microcom Inc. QX/4232hs	Multi-Tech Systems Inc. MultiModem V32	Universal Data Systems, Inc. FasTalk V.32/42b	U.S. Robotics Inc. Courier V.32
1. Price / Performance	●	◒	◒	◒	◒	◒
2. Support of Older Modems	●	●	●	●	●	●
3. V.32 / V.42bis Compatibility	●	●	◒	○	○	●
4. Overall Performance	●	●	●	●	●	●
5. Quality of Workmanship	●	◒	◒	◒	◒	◒

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> Multiprotocol backbones are "an absolutely needed transitional migration tool if anyone is serious about going to open networks and open systems."
>
> **Nick Lippis**
> Principal
> Northeast Consulting Resources, Inc.
> Boston

Data Packets

General DataComm, Inc. last week introduced an entry-level network management package to monitor and control its leased-line modems and data service units (DSU).

The Netcon Small Systems Controller consists of software and a four-port network management interface board for DOS-based microcomputers. A fully configured system can support as many as 256 modems, DSUs or a combination of both.

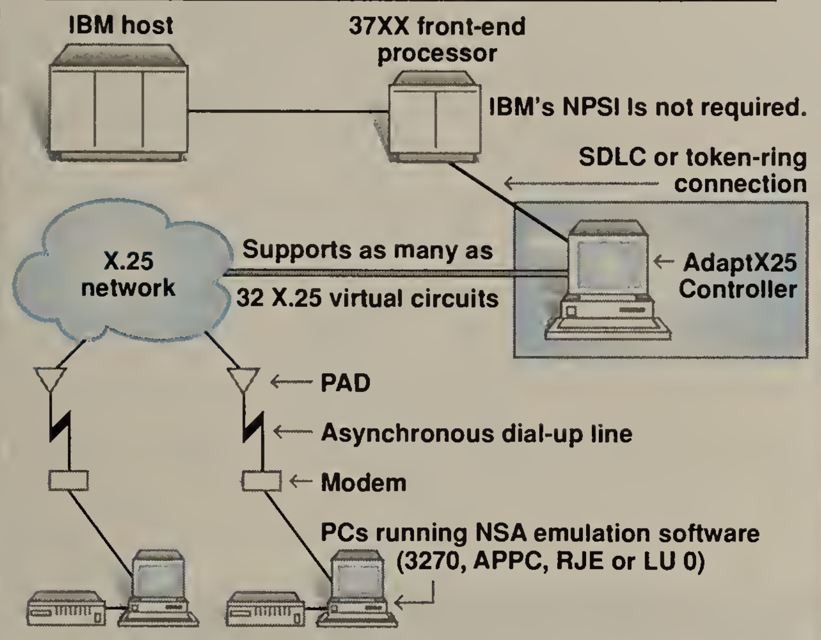
Network management data is fed via a sideband channel at 75 bit/sec from remote-site modems or DSUs on a multidrop line to a central-site master modem. Users can then connect master modems or DSUs together in daisy-chain fashion into a port on the Netcon Small Systems Controller interface board.

This enables a central-site operator to monitor the operation of central-site and remote modems or DSUs. The operator can also run diagnostic tests such as loop-back tests on remote units, as well as reconfigure them.

Remote units can also forward alarms to the Netcon Small Systems Controller to report operational problems. Those alarms can be stored in a data base, thus enabling users to generate historical alarm reports for any modem or DSU in the network.

The Netcon Small Systems Controller costs $7,500 and is available now. ◪

NSA provides dial-up X.25-to-IBM link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AdaptX25 Controller
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Asynchronous dial-up line
Modem
PCs running NSA emulation software (3270, APPC, RJE or LU 0)

NSA's AdaptX25 controller appears to IBM hosts as an SNA cluster controller and gives PC users dial-up X.25 access to IBM mainframe applications using a variety of SNA protocols.

NPSI = Network Control Program Packet-Switching Interface
RJE = Remote job entry

SOURCE: NETWORK SOFTWARE ASSOCIATES, INC., LAGUNA HILLS, CALIF.
GRAPHIC BY SUSAN J. CHAMPENEY

NSA controller gives PCs X.25 dial access to hosts

Software turns micros into dial-up X.25 controllers.

By Paul Desmond
Senior Editor

LAGUNA HILLS, Calif. — Network Software Associates, Inc. (NSA) last week introduced software that turns a personal computer into a controller through which other microcomputers can get dial-up X.25 access to IBM mainframe applications.

The AdaptX25 software runs on an IBM AT Personal Computer or Personal System/2, turning it into what NSA calls an AdaptX25 Controller. The controller, which can be located either local to the host or remotely, appears to the host as an IBM 3X74 cluster controller and supports as many as 32 virtual circuits.

> The product is targeted at companies that are migrating to LU 6.2-based applications.
>
> ▲▲▲

To access the controller, personal computer users need NSA's IBM emulation software, a modem and an X.25 packet assembler/disassembler. The latter is typically provided by public X.25 network vendors or configured as a shared device in a private X.25 network.

AdaptX25 obviates the need for IBM's Network Control Program Packet-Switching Interface (NPSI) for users that want to communicate with their Systems Network Architecture hosts via X.25 packet networks. NPSI has long been considered difficult to work with and, at least in early versions, a performance bottleneck.

"Another big advantage is the fact that we support all the different SNA protocols," said Russ Hertzberg, manager of product marketing at NSA.

Competing products from vendors such as Packet/PC, Inc. also support dial-up X.25 links to IBM mainframes but only for 3270 applications, Hertzberg said. By contrast, AdaptX25 supports 3270, LU 6.2/Advanced Program-to-Program Communications, remote job entry (RJE) and LU 0, he said.

The product is targeted at companies such as large financial institutions that are migrating to LU 6.2-based applications. AdaptX25 could be used, for example, to give users at small remote offices access to those applications over switched links rather than more costly dedicated links.

AdaptX25 can be used with either public or private X.25 networks. It has been certified as compatible with BT Tymnet, Inc.'s public data network, and other certifications are pending,

(continued on page 22)

Users are divided on OfficeVision delays

Potential buyers, frustrated over delivery delays for advanced features, look to other offerings.

By Jim Brown
Senior Editor

Current and potential users of IBM's OfficeVision had mixed reactions to recent news that IBM is yet again delaying delivery of some key capabilities for the Systems Application Architecture-compliant office system.

Some prospective users said they may opt for competing products rather than wait for IBM to deliver advanced OfficeVision capabilities that are already almost a year overdue.

But current OfficeVision users said they aren't overly concerned about IBM's slow progress in providing those features, including the cooperative processing capabilities being built into the products.

Last month, IBM indefinitely delayed delivery of the second version of its local-area network-based OfficeVision, dubbed OfficeVision/2 LAN Series, ("OfficeVision delay blamed on change in OS/2 support," *NW*, Dec. 24, 1990). However, IBM vowed to enhance the existing version of OfficeVision/2 LAN Series to keep current users from defecting to other products (see "IBM hopes to appease users," page 20).

In its December announcement, IBM also said it will ship the second release of OfficeVision/MVS for MVS-based hosts, OfficeVision/VM for VM-based hosts and OfficeVision/400 for Application System/400 minicomputers that will lack a key module enabling those systems to support directly attached OS/2 microcomputers.

Customers most affected by the delay are those that had pinned their hopes on the feature-rich Version 2 of OfficeVision/2 LAN Series. Some of those users did not implement the first version because it lacked necessary features.

With shipment of the second version delayed, these users are now examining competing products that weren't available when Version 1 was released in September 1989.

"The delay is allowing us to bring into the evaluation process products that weren't ready [when the first release of OfficeVision came out]," said George Oliver, manager of information delivery technology for the Royal Bank of Canada in Toronto.

The bank needs office software that will enable nearly 15,000 users of microcomputers, which are attached to as many as 2,000 LANs, to access applications on any machine and easily swap electronic mail and files. IBM promises these features will be in the next version of OfficeVision/2 LAN Series.

Oliver said the bank is now closely examining NCR Corp.'s Cooperation software and Lotus Development Corp.'s Notes groupware packages.

Both products were unavailable when IBM shipped the first version of OfficeVision/2 LAN Series, which runs under IBM's LAN Server net operating system and provides a limited set of office automation functions for OS/2

(continued on page 20)

Codex launches new line of V.32/V.32bis modems

By Paul Desmond
Senior Editor

MANSFIELD, Mass. — Codex Corp. last week introduced a new line of V.32/V.32bis dial-up modems, including the company's first V.32bis network-managed dial-up modems.

Codex also announced the second release of its 9110 Dial Management System, which adds support for the six new 326X Series modems to the dial modem net management system.

The 326X series includes three stand-alone modems, the 3260, 3261 and 3265, as well as three rack-mountable versions, the 3262, 3263 and 3267.

With pricing starting at $1,195, the modems are intended to offer more functions at a lower price than previous Codex V.32 dial modems.

"It's a pretty good price for this kind of feature package," said Larry Cynar, a senior industry analyst at Dataquest, Inc., a consultancy in San Jose, Calif.

(continued on page 22)

Users divided on OfficeVision

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Extended Edition 1.2- and DOS-based microcomputers.

IBM promises that the second version will support advanced cooperative processing capabilities and an improved graphical interface dubbed Desktop. Desktop will enable users to access applications easily, regardless of where they reside.

The history of delays in shipping OfficeVision has caused IBM some headaches in the mainframe environment, its traditional stronghold. Some users bypassed the initial version of OfficeVision in favor of other firms' office automation software.

"Our commitment to OfficeVision was always kind of soft," said Terry Eikenbery, data processing executive officer with C&S/Sovran Financial Corp., formed after the recent merger between regional banking giants Citizens & Southern Corp. (C&S) and Sovran Financial Corp.

Eikenbery said Sovran examined a host-based version of OfficeVision before the merger and was considering implementing it until rumors that enhancements would ship late started cropping up.

"At the begining, OfficeVision looked like a great direction to take strategically," Eikenbery said.

"But as we looked at the warts and moles of the early release and heard shipment dates were slipping, its solidity as a strategic direction softened," he added.

Following the merger, Sovran decided to implement the same office automation product C&S was using, Fischer International Systems Corp.'s host-based Electronic Mail Communication Center/Totally Automated Office. Fischer's product offers many of the same functions as the initial host-based OfficeVision product, including a companywide E-mail system, calendaring and word processing.

Fischer will add more features to keep the product competitive with OfficeVision, including offering a LAN version, Eikenbery said.

Current users of OfficeVision have little problem with the delays, however. For Federal Kemper Insurance Co., the delay in the second version of OfficeVision/2 LAN Series will allow top executives to become more proficient in the use of the first version before they are asked to learn advanced features of the second version, said Ed McClure, assistant vice-president of information processing.

Frank Fitzsimmons, director of judicial information systems for the 17th Circuit Court of Florida in Broward County, said the delay means little to him. Existing OfficeVision functions are sufficient today, and he said he is in no rush to add functions. "You don't fix what works," Fitzsimmons said.

Currently, staff on remote DOS-based microcomputers emulating IBM 3270 terminals use OfficeVision running on an MVS-based host to access about 20 different mainframe applications. Some microcomputer applications can also use IBM's LU 6.2 to extract information from probation and jury selection data bases on the host.

The next step, Fitzsimmons said, is to move users to OS/2 machines and use the OS/2 direct-connect feature to eliminate the need for terminal-emulation software to run host-based applications or to retrieve host data. ◼

IBM hopes to appease users

WHITE PLAINS, N.Y. — IBM recently acknowledged that delayed development of the second, more feature-rich version of OfficeVision/2 LAN Series could hurt its efforts to become a major player in the local-area network-based office systems market.

Delaying shipment of the second version gives users more time to examine competing products such as NCR Corp.'s Cooperation software, scheduled for full availability in 1991, as well as AT&T's Rhapsody Business Orchestration Solution and Digital Equipment Corp.'s All-in-1 Phase II, which are shipping now.

In order to keep its 300 to 400 current OfficeVision/2 LAN Series users satisfied and to lure new users, IBM has promised to upgrade the existing version with six new features — which are among the enhancements that will be included in the second version.

Tony Mondello, vice-president of office system development in IBM's Application Solutions Division, said one enhancement will enable users to access DOS-based applications anywhere on the network by clicking on an icon displayed on the product's Desktop graphical user interface. Previously, users could only access OS/2-based applications. Version 2 of OfficeVision/2 LAN Series will include a more feature-laden Desktop.

Enhancements to Version 1 will also enable developers to build OfficeVision electronic mail functions into existing applications, enabling users to send E-mail without leaving their current application. Another enhancement will improve how updates to E-mail directories are distributed across the LAN.

The enhancements are scheduled to ship in March 1991.

— Jim Brown

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Codex launches modem line

continued from page 19

Among those features is the ability to operate at synchronous transmission speeds of 14.4K, 12K and 7.2K bit/sec, all a function of support for the V.32bis standard. Each modem also supports the V.32 speeds of 4.8K and 9.6K bit/sec, as well as the full gamut of lower speeds down to 300 bit/sec, said David McNamara, manager of V.32 product planning at Codex.

Codex also added support for the CCITT V.42bis data compression standard, which is compatible with Microcom, Inc.'s Microcom Network Protocol 5, McNamara said. Support for V.42bis, coupled with the speed supported by V.32bis, lets the modems achieve asynchronous throughput at speeds up to 38.4K bit/sec.

McNamara said the modems are smaller and more reliable than the Codex 2260 and 1100 families they are intended to replace. The mean time between failure for the 326X line will be 100,000 hours, whereas it is about 70,000 hours with the Model 2264, he said.

The 3260 is the U.S. stand-alone version, while the 3265 is the international stand-alone model. The 3261 is a stand-alone model that has a four-wire leased-line interface with dial restoral so it can be configured as a dial-up or leased-line modem.

Rack-mountable models include the 3262 for the U.S. and the international 3267. The 3263 is identical in function to the 3261 but is rack-mountable.

Except for the 3263, the rack-mountable models come two on a card. They are small enough that 42 modems can fit in 14 inches of vertical rack space, whereas with the previous 2264, only eight modems could fit in that space, McNamara said.

Each modem is available in either managed or unmanaged versions. Only the unmanaged version of the 3260 is available now. The others are expected to be released at various times in May, when all the U.S. versions will be available. International versions will roll out at various times throughout the year.

Prices range from $1,195 for an unmanaged 3260 or $1,395 for the managed version to $2,195 for an unmanaged two-modem 3262 card or $2,495 for a managed version. Pricing on the international versions is not yet available.

The 9110 net management software runs on an IBM Personal Computer AT. It supports local and remote modem configuration and diagnostics, device polling, line-quality verification, event reporting and utilization statistics. The system works with both Codex's and other vendors' dial-up modems, regardless of whether they support network management, McNamara said.

Release 2 of the software will be available in February. Pricing depends on configuration but begins at about $2,000. ◘

Controller gives PCs X.25 access

continued from page 19

Hertzberg said.

Personal computers used to support the software must have at least 256K bytes of memory. That computer can be connected to an IBM front-end processor via a Synchronous Data Link Control connection or token-ring net.

Hertzberg said using a token-ring connection to the front end is another advantage his product provides over IBM's NPSI, which only supports leased-line connections, typically at 56K bit/sec or less. The token-ring connection provides at least 10 times better performance with any NSA emulation package than a leased-line connection does, he said.

AdaptX25 works only with NSA emulation software running on attached personal computers, although Hertzberg said NSA is willing to work with other vendors of emulation software to support their products.

AdaptX25 will be available next month at a cost of $2,995. NSA emulation software ranges from $245 for a 3270 package to $785 for RJE emulation. ◘

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LOCAL NETWORKING

PC AND TERMINAL-TO-HOST LANS, GATEWAYS AND MICRO COMMUNICATIONS PRODUCTS

Worth Noting

> "I've never met a user with a Banyan [Systems, Inc.] VINES network that didn't love the product. But in the LAN Manager vs. NetWare debate, VINES is nowhere to be found."
>
> **Mary Modahl**
> Director of network strategy research
> Forrester Research, Inc.
> Cambridge, Mass.

Netnotes

Chipcom Corp. has been tapped by **Electronic Data Systems Corp. (EDS)** to provide Chipcom's ORnet fiber-optic Ethernet products as part of the U.S. Army's $700 million Small Multiuser Computer contract awarded to EDS.

EDS will supply the Army, Navy and Defense Logistics Agency with Chipcom's ORnet Star Coupler, ORnet Fiber Transceiver and ORnet/PC Ethernet Adapter Card products.

According to Chipcom officials, the contract calls for the purchase of as many as 20,000 multiuser systems.

Network Computing Devices, Inc. (NCD) last week added a flat-screen model to its X Window System terminal product line.

The NCD14c features a 14-in., color, flat-screen monitor. The monitor supports 8-bit planes, displaying 256 colors from a palette of 16.7 million colors.

The $3,000 terminal is powered by a 20-MHz Motorola, Inc. 68020 processor. The NCD14c also supports Telnet and Local Area Transport (LAT) host sessions using VT-220 terminal emulation.

The NCD14c supports Motif, Openlook and Xview graphical user interfaces, as well as DECwindows applications.

The terminal comes equipped with 4M bytes of random-access memory. ◘

Newport offers dynamic compression for gateways

Software, board offer 4-to-1 data compression.

NEWPORT BEACH, Calif. — Newport Systems Solutions, Inc. last week announced a daughterboard and software for Novell Inc.'s NetWare Link/64 and Link/T-1 wide-area gateways that provides dynamic data compression.

The proprietary compression algorithm used with the enhancement provides an average compression ratio of 4-to-1, depending on the data to be compressed. Use of the product will enable customers to quadruple the throughput of wide-area links or reduce response time by an average of 75%.

Newport makes the Link/64 and Link/T-1 for Novell but, according to Newport President Larry Stephenson, the compression enhancement is the first add-on product for the devices that Newport will sell directly.

The Link/64 and Link/T-1 are board-level products for NetWare servers that are reportedly as easy to install as local network interfaces. Both have two ports for wide-area links: The Link/64 has two ports that support speeds up to 64K bit/sec, whereas the Link/T-1 has two 1.544M bit/sec ports.

While the enhancement can be used with the Link/T-1, the highest speed circuit that can be compressed is 128K bit/sec, meaning most customers would only use the feature on the secondary port for locations with less demanding needs.

A compressed 128K bit/sec channel can provide effective throughput of 512K bit/sec. When used with 9.6K bit/sec links, a compressed channel provides effective bandwidth of 38.4K bit/sec or more.

Stephenson said the feature provides the most benefit when used to compress data such as text files. Binary files are less compressible, while files that have been previously compressed for storage are typically transmit-

(continued on page 24)

New Apple Ethernet cards have separate transceivers

By Eric Smalley
Senior Editor

Apple Computer, Inc. last week announced a series of Ethernet cards for its Macintosh II and Macintosh LC computers that have separate transceivers, allowing users to change Ethernet media without swapping out adapter cards.

The company also introduced updated X Window System software for the Macintosh line that integrates the Macintosh and X Window environments.

The Ethernet cards are plug and play and can be installed easily, an Apple spokeswoman said.

The Apple Ethernet NB Card, scheduled to be available in the second quarter of this year, connects to the NuBus of the Macintosh II series computers, including the new Macintosh IIsi. The Apple Ethernet LC Card, available now, supports the Macintosh LC computer introduced last fall.

The new interfaces have lower prices than previous Macintosh adapter cards. The Ethernet LC Card costs $199, and the NuBus card is priced at $424.

The Ethernet transceivers, introduced with the adapter cards, connect the cards to standard, thin-wire and twisted-pair Ethernets. The twisted-pair transceiver is designed to be compatible with any 10BaseT Ethernet concentrator, according to company officials, while the thin-wire transceiver includes a built-in terminator. The transceivers are priced at $175 each.

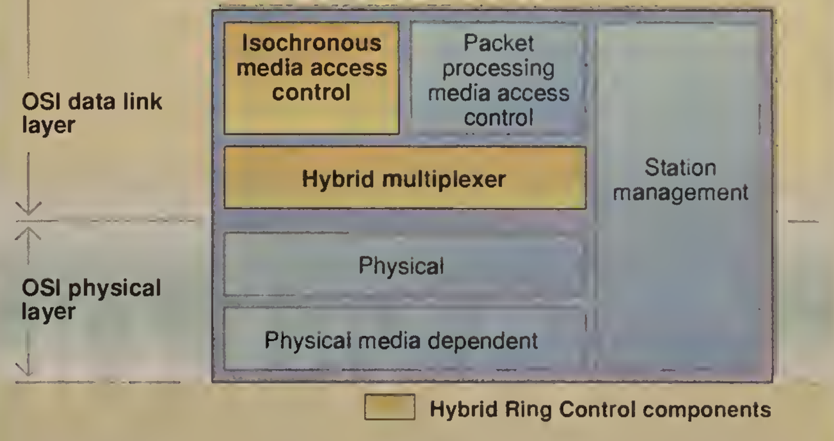
The X Window software includes MacX 1.1 and X Window System 2.1 for A/UX, Apple's version of Unix.

MacX 1.1, which includes the X Window System Version 11 Release 4 code, allows users to cut and paste between Macintosh and X Window applications. The software also supports Multifinder, which allows users to switch between Macintosh and X Window client applications. The window manager included in the MacX 1.1 software allows X Window applications to be called into Macintosh-style windows.

X Window System 2.1 for A/UX provides an X Window application development environment for Macintosh computers running A/UX.

MacX 1.1, priced at $295, and X Window System 2.1 for A/UX, priced at $349, are expected to be available later this month. ◘

FDDI II to carry circuit-switched traffic



The new Hybrid Ring Control components will combine circuit-switched traffic and packet traffic on FDDI nets.

GRAPHIC BY SUSAN J. CHAMPENY — SOURCE: FIBERMUX CORP., CHATSWORTH, CALIF.

FDDI-II to include dedicated channels

New version will carry voice, video and data but lacks compatibility with current FDDI standard.

By Eric Smalley
Senior Editor

Although the standard for Fiber Distributed Data Interface high-speed local-area networks has yet to be completed and FDDI products are only beginning to trickle into the market, debate has begun over the next generation of FDDI technology.

The proposed standard for FDDI-II signals a radical departure from the token-passing, packet-based FDDI-I, including the addition of Integrated Services Digital Network-like capabilities.

The FDDI-II proposal defines a method for combining circuit-switched traffic with packet traffic over FDDI networks. Adding circuit-switched traffic to FDDI will allow users to integrate voice, data and video traffic on a single LAN backbone.

However, according to industry sources, FDDI-II is inadequate as proposed and the technology could prove unnecessary in the long run.

The principal shortcoming of FDDI-II is its incompatibility with FDDI-I, according to Michael Howard, president of Infonetics Research Institute, Inc., a market research firm based in San Jose, Calif.

"As a follow-on to FDDI-I, it wouldn't make sense. It's a different network," Howard said.

Under FDDI-II, stations equipped with Hybrid Ring Control (HRC) components would be able to operate as FDDI-I stations on existing FDDI rings. But in order to operate as FDDI-II stations, all of the devices on the ring would have to be equally equipped, according to Emily Green, FDDI product manager at Fibermux Corp., an FDDI vendor in Chatsworth, Calif.

FDDI-I is a dual-ring, token-passing, fiber-optic network that carries packet-based traffic in synchronous or asynchronous mode at 100M bit/sec.

Unlike FDDI-I, FDDI-II can carry isochronous traffic. Isochronous networks are synchronized to a real-time clock and are compatible with the 8-kHz timing standard of the public network, according to Bruce McClure, president of Synernetics, Inc., an FDDI vendor in Billerica, Mass., and sponsor of the FDDI Station Management Forum.

> The principal shortcoming of FDDI-II is its incompatibility with FDDI-I, according to Infonetics' Michael Howard.
>
> ▲▲▲

The HRC components include an isochronous media access control (MAC) layer that operates along with the packet MAC layer of the FDDI-I standard (see graphic, this page). A new layer, the hybrid multiplexer, is inserted between the physical layer and the two MAC layers.

FDDI-II networks carry a type of frame called a cycle, with a new cycle released onto the ring every 125 microsec. The Hybrid Multiplexer builds and dismantles the

(continued on page 24)

FDDI-II to get dedicated channels

continued from page 23

cycles and passes data to the isochronous MAC layer or the packet MAC layer based on information in the cycle header.

Each cycle carries as many as 16 channels, while each of the channels take up 6.144M bit/sec of bandwidth and can be subdivided into 64K bit/sec channels. Each 6.144M bit/sec channel can be allocated to carry isochronous traffic. If a channel is unallocated, it carries packet-based traffic.

The underlying physical and physical media-dependent layers do not have to change in order to implement the HRC components. Without change to those layers, the FDDI-II network will operate at the 100M bit/sec rate of FDDI-I. The proposal for the physical layer of FDDI-II has not been completed, and changes to that layer could result in higher bandwidth.

Higher bandwidth should be the goal of network developers, according to Infonetics' Howard. Alternative high-speed networks operating in the range of 800M to 1G bit/sec would be fast enough to carry circuit-switched traffic, obviating the need for the hybrid architecture, he said.

Although the final elements of the FDDI-I standard have yet to be completed and elements of the FDDI-II standard have yet to be proposed, the HRC document is largely complete and semiconductor manufacturers could soon begin developing FDDI-II chipsets.

According to Howard, this poses a problem because vendors must decide whether to build FDDI-II products or look to alternative high-speed networks. He said few will be willing to split their development efforts.

Proponents of FDDI-II argue that the standard will define the type of network that many users believed would be implemented by FDDI-I.

"FDDI-I isn't appropriate for some kinds of communications, including real-time voice, video, process control and some time-sensitive host-to-terminal traffic. The [potential] FDDI-II market is all those people who realized that [FDDI-I] can't replace all their backbones," Fibermux's Green said.

But the need for the isochronous capabilities of FDDI-II has been called into question.

"You can run compressed video in synchronous mode on FDDI-I," said Paul Callahan, marketing manager for advanced technology at Digital Equipment Corp.'s Telecommunications and Networks Group in Littleton, Mass.

Although voice applications are suited to the isochronous capabilities of FDDI-II, there has been little demand for integrated voice and data, Callahan said.

DEC recently voted against the call for approval of the physical and MAC layers of the FDDI-II standard but included specific technical recommendations, according to Callahan. If those recommendations are adopted, DEC will support the standard, he said.

The letter ballot for the physical and MAC layers of the standard is due to the committee this month. However, the station management portion of the FDDI-I standard won't be complete until April at the earliest, and a proposal for the station management portion of the FDDI-II standard won't be issued until after then, according to Green.

The FDDI-II standard as a whole will not likely be completed for 1½ years, she said. ◘

Newport offers compression

continued from page 23

ted without further compression.

The data compression enhancement costs $1,595 and is available now.

Newport, founded in 1988, also sells the LAN^{2}LAN/Compression Router and other internetwork products.

For more information, contact the company at 4019 Westerly Place, Suite 103, Newport Beach, Calif. 92660, or call (800) 662-4677. ◘

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MANAGEMENT STRATEGIES

MANAGING PEOPLE AND TECHNOLOGY: USER GROUPS AND ASSOCIATIONS

Dialogue

Should users try to establish their own network architecture, adhere to a vendor-specific architecture such as IBM's Systems Network Architecture or buy products that best fit their requirements on a case-by-case basis?

"Ideally, companies should establish their own [architecture] based on industry standards. I always choose systems based on standards unless the application is extremely critical and is only available through a proprietary system.

"I still use SNA networking when I have applications that require an IBM mainframe and are only supported by the IBM 3270 architecture. But whenever we get new technology, we try to go with what we think is the future — [Simple Network Management Protocol-managed] Ethernet networks and Unix-based systems."

Charlie Snell
Director of computing and communications services
Harris Corp.
Melbourne, Fla.

"Business requirements must drive everything you do. If you get hung up with technology for technology's sake or standards because it's a good idea to have standards, you will miss the mark.

"However, there is a point at which the overhead cost of supporting a diverse set of products exceeds the benefits you get from buying those products individually. The real trick is to find the balance between satisfying business needs and the advantages gained by adhering to a systems architecture."

Rick Segal
Technical advisor
Aetna Casualty & Surety Co.
Hartford, Conn.

"That's difficult to answer; it varies from firm to firm, and it could be any of those options at any given time. A lot of it depends on a company's size, the strategic issues it faces and the applications to be supported. It could be that your company has a set of applications that no vendor-specific architecture can adequately support.

"At Baxter, we are moving increasingly toward virtual and switched services. This type of

(continued on page 26)

Challenging environment keeps workers motivated

Net managers say money isn't best incentive.

By Wayne Eckerson
Senior Editor

The economic downturn and increasing cost-consciousness of top management has forced network departments to run lean, putting a premium on motivating staffers to perform at high levels.

Most network managers said they motivate employees by trying to provide a stimulating work environment in which staffers can advance in their careers, expand their technical or business knowledge, and gain a sense of achievement.

According to David Javitch, president of Javitch Associates, a management consulting firm in Newton, Mass., creating an environment in which workers can satisfy inner needs for achievement, recognition and growth is the key to motivating individuals (see graphic, page 26).

Workers are also motivated by managers who have high performance expectations and allow them to take on additional responsibilities, he said.

Javitch cautioned managers not to be deceived into thinking that salary, benefits, office space or other external factors can motivate employees. While these elements must be present at adequate levels in order for employees to be motivated, they do not satisfy workers' inner needs and can, at best, only motivate workers for a short period.

While raises and bonuses may be seen as strong incentives, it is the feelings of accomplishment, recognition or advancement that truly motivate people, he said.

Most network managers said they practice management by objective, which involves sitting down with employees at least once a year to set goals that can be achieved in a given period of time.

"My basic strategy is to make them feel like winners," said Larry Betsinger, senior vice-president at UJB Financial Corp. in Princeton, N.J.

"It's important that employ-

(continued on page 26)

GUIDELINES
BY BRUCE ELBERT

Using pilot tests to their full potential

A pilot test is a powerful tool for evaluating a network's capabilities under real-world conditions. A thorough pilot test can help users avoid making a costly purchasing mistake. It can also allow them to demonstrate the proposed product or service to internal users, thereby obtaining end-user input and, ultimately, their buy-in.

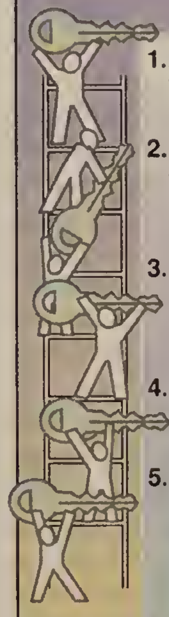
To get the most out of a pilot test, network managers should follow a few simple guidelines:

- **Don't use a pilot test as a substitute for following standard purchasing procedures.** The pilot test is a stage in the procurement cycle, which includes planning, engineering, the request for proposal as well as the proposal evaluation, selection and implementation. Ideally, conduct the pilot test after you have released the RFP to compare vendor alternatives or after you have selected a vendor to verify that the technology and the vendor are the best for your application.
- **Don't assume a pilot test is free.** Vendors will typically supply equipment and services without cost for a certain period of time. However, you will incur expenses since the trial will be performed on your facilities. Make sure to budget the people, space and other support needed to conduct a thorough pilot test.
- **Make it a real-world test.** Don't be afraid to push a product or service to its limits. Prepare a series of tests that exercise the system at levels you would expect under a heavy load. But don't use mission-critical applications or live data

(continued on page 26)

Elbert is director of operations for a large communications company.

Keys to motivating staff



1. **Achievement:** Set reasonable goals for workers to achieve. This will increase their confidence and self-esteem.
2. **Growth and advancement:** Provide workers the opportunity to improve their knowledge, skills and ability, as well as to advance within the organization.
3. **Responsibility:** Increase the number of tasks the employee performs (job enlargement) or assign more challenging duties (job enrichment).
4. **Recognition:** Provide positive feedback for good performance.
5. **Level of expectations:** Hold high expectation levels of your employees. Workers perform to the level of their managers' expectations of them. Therefore, managers who hold high expectations usually have workers who perform at a high level.

GRAPHIC BY SUSAN J. CHAMPENY SOURCE: DAVID JAVITCH, JAVITCH ASSOCIATES, NEWTON, MASS.

ONE chief discusses group's top concerns

Organization of Network and Equipment User Group's Lonsbury talks about issues of the day.

Q&A Comprising 125 top customers of AT&T, the Organization of Network and Equipment (ONE) User Group wields considerable clout with the company and has helped shape many of AT&T's new products and services.

Founded in 1972 as the Electronic Tandem Network (ETN) User Group, ONE consisted primarily of voice network managers whose companies were big users of AT&T private branch exchanges.

In 1988, the group broadened its mission and assumed its current name in an effort to meet the needs of an increasing number of members whose responsibilities had grown to include both voice and data communications and whose contacts with AT&T spanned multiple business units.

Today, ONE serves as a forum in which members can express their concerns and needs regarding the full spectrum of AT&T's products and services.

ONE holds semiannual conferences, and its executive board meets monthly with representatives from all of AT&T's business units, including Network Services, AT&T Paradyne and Business Communications Systems, to discuss member concerns and strategic issues.

Network World's Senior Editor Wayne Eckerson recently spoke with ONE President Thomas Lonsbury about a range of issues involving AT&T, as well as emerging trends in communications.

Lonsbury is manager of communications at Summit Information Systems, Inc., which is a subsidiary of Roadway Express, Inc. in Akron, Ohio.

With the growing popularity of virtual voice services, what will be the future role of ETNs?

Although virtual services are becoming widely employed, I think that ETN networks will continue to fill some of the communications needs of today's large customers. Virtual services have come a long way, but they still have some distance to go before they equal the flexibility and availability of ETN.

> "Virtual services have come a long way, but they still have some distance to go before they equal the flexibility and availability of Electronic Tandem Networks."

▲▲▲

Unlike ETN, virtual services are still not available in every LATA and may not be as cost-effective as private lines depending on the applications. The real trend is toward hybrid networks, or a mix of public and private services. Many users are finding that hybrid nets provide the best flexibility and price performance.

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Using pilot tests to full potential

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for this test because any failure could have dramatic repercussions that could prejudice users against the system.

- Be prepared to demand corrective action. If something isn't suitable with the system, involve the vendor immediately so that it can explain or correct the problem.

Be as demanding of vendors as you would if you were their actual customers. Don't worry about the fact that you are getting free use of the product — you are spending your time and your organization's resources to evaluate the vendor's capabilities.

- Don't be afraid to reject the system. We are all human, and it is natural to be reluctant to disappoint someone who is sharing something with you for free. Buyers tend to be passive, allowing the more aggressive vendors to gain leverage through pilot tests.

According to a survey of information systems and network managers by Forrester Research, Inc. of Cambridge, Mass., few companies reject products because of a pilot test. The study stated that managers frequently use pilot tests as a rubber stamp for their decisions rather than to evaluate products objectively.

- Use the pilot test to create a detailed implementation plan. You should use the trial to know how the system will work in your environment if you purchase it. And you should make note of such details as cabling, interfaces, test equipment and support devices. Training programs and procedures will also have to be created so that your people and users are ready to accept the system.

Dialogue

continued from page 25

architecture allows us to acquire and divest businesses — essentially large blocks of users — without having to make major changes in the network infrastructure."

George Sparks
Manager of telecommunications planning
Baxter Healthcare Corp.
McGaw Park, Ill.

"The hardest thing to do is develop an architecture or standards, but it is important. While many companies still rely on a vendor-specific architecture, we don't believe it's to our advantage to revolve our entire system around SNA or X.25, for example. But we will make use of those standards as we can fit them into our applications."

Lewis Weinstein
Manager of telecommunications
Morgan, Lewis & Bockius
Philadelphia

Challenge moves workers

continued from page 25

ees know what they need to do to be successful and that they have a reasonable chance of attaining the goals set for them," he said.

Other managers said they motivate workers by giving them the opportunity to grow personally and professionally in their jobs.

ONE User Group profile

Founded: In 1978 as Electronic Tandem Network User Group. Changed name in 1988 to ONE User Group.

Members: 125 large AT&T corporate customers.

Mission: To provide a forum for senior decision makers at large companies to address strategic issues concerning the broad spectrum of AT&T products and services through peer exchanges and frequent meetings with senior AT&T officials.

Activities: The group's executive board holds a monthly conference call with representatives from each of AT&T's business units to discuss issues of concern to members. The group also sponsors 2 conferences a year.

ONE = Organization of Network and Equipment

GRAPHIC BY SUSAN J. CHAMPENEY

SOURCE: ONE USER GROUP, BRIDGEWATER, N.J.

Richard Bretagne, chief information officer of Northwestern Memorial Hospital in Chicago, said the hospital recently implemented a dual career path in information systems that allows technically oriented individuals to advance within the organization without having to move into management.

Currently, the hospital has six individuals in its technical career track. These people, who serve as systems integration specialists, can advance to a level equivalent with second-line management and eventually earn a salary of $70,000 or more, Bretagne said.

Greg Crosbie, director of telecommunications and administration at the *Journal of Commerce* in Phillipsburg, N.J., said providing a stimulating work environment that challenges people with new projects and problems is the key to motivating employees.

Crosbie said his staff of three is kept busy and intellectually engaged in managing a voice and data network that runs from the U.S. to Europe and the Far East and supports host computers from seven different vendors.

"It is the constant thrill of learning that motivates people," Crosbie said. "We're never bored because we have something new and different to do every day."

Many managers said recognizing workers for their successes and contributions to a team project is a powerful motivator.

Jerry Appleby, vice-president of telecommunications at Security Pacific Automation Company, Inc., said that in his former capacity as president of the Tele-Communications Association, Inc., he discovered the importance of recognizing individuals for their contributions to the group.

"The best motivator is praise, especially in a volunteer organization where you can't reward people with bonuses and raises," Appleby said.

At Security Pacific, Appleby said he makes sure that he publicizes the good work his staff is doing to the whole company through regular reports.

"We try to get the good word out to end users and senior management about our successes," Appleby said. "Getting recognition from others helps staff morale and keeps us motivated."

Chief discusses group's concerns

continued from page 25

Is AT&T committed to supporting ETN networks, or is it trying to migrate users to virtual networks?

Yes, on both counts. AT&T is committed to supporting ETNs, but it is also trying to offer services that meet user needs for higher performance and value. Most users today are adopting hybrid networks that combine both private and public facilities.

Many industry observers say that voice communications has become a commodity? Do you agree?

While voice may be a commodity, it still generally drives the communications costs of most companies. However, many of our members have been asked to move into data, which is one of the reasons our group changed its name and focus three years ago. Our members have traditionally been on the voice side of the house. ONE's focus is now to help members operate as effectively as possible in an integrated voice and data networking environment.

How have ONE members handled the transition from managing voice-only networks to integrated voice/data nets?

Some members have fared better than others. Fortunately, vendors such as AT&T have offered products and support services that have helped our members plan and manage integrated voice and data networks.

Often, it's not the technology that's difficult to overcome, but the internal organizational changes. Typically, data and voice groups have existed as small, self-contained empires and this has made it difficult to merge the groups.

In September, AT&T announced QualNet Enhanced Support Program to provide customers with end-to-end, single-point-of-contact service for all their PBX-based network problems. Some users have said QualNet is an attempt by AT&T to make users pay for something they previously received for free. Is this a fair assessment?

QualNet is viewed differently by different members.

Most of our members realize that they have been pushing AT&T to be more competitive in their pricing and more flexible in the service options they offer. QualNet is an attempt by AT&T to offer customers a choice.

We can argue that we used to get that service for free. However, free service is not an option anymore. It is difficult these days to find any vendor that provides anything for free. It may appear to be free, but if you look across the full spectrum of products and services a carrier offers, you will find a cost somewhere.

We really need to look at these types of offerings from a total value perspective and realize that we get what we pay for.

Some users have complained that vendors are pricing maintenance services for older equipment in such a way as to force users to move to newer models. Do you agree?

Yes. Maintenance services are just plain big business. We users are trapped. We need it, we buy it and we lock in years for price [discounts]. However, I don't think migration is the sole reason. As technologies age, fewer and fewer customers use them. The embedded vendor costs for training, inventory, manufacturing and distribution must be applied to a smaller customer base, thus raising the individual customer costs.

Would members say that AT&T's structure, with separate business units, has improved or hurt service?

This is a difficult question because I don't believe we have yet to experience the full effect of AT&T's reorganization into business units.

Right after AT&T reorganized, there was a lot of finger pointing among AT&T groups. When confronted with a problem, one AT&T group would often say that the problem wasn't within their area of responsibility and to call another group. We thought we were getting one-stop shopping and we weren't. Even the national account teams weren't keen on knowing exactly what the business units were doing.

In the past year and a half, however, there has been noticeable improvement. There is now a greater willingness among all AT&T employees to take responsibility for customer needs despite geographical or divisional responsibilities.

Would members say AT&T service has improved or declined since deregulation?

Although some customers would say services have declined, I think AT&T's service has improved to a large extent because of new technologies and AT&T's ability to manage them.

Digital equipment, fiber optics and new proactive maintenance systems have reduced the number and duration of AT&T outages. In addition, the advent of self-healing networks, remote maintenance capabilities and new service offerings such as QualNet, NetCare and Network Management Centers should further improve carrier performance and network availability.

Should AT&T be freed from regulatory restrictions to compete on equal footing with other carriers?

Most definitely. If you look at the latest figures, AT&T has lost significant market share to other carriers. The restrictions placed on AT&T really hurt customers and basically have put sand in the gears of the free-market system.

The restrictions make it more costly for AT&T to do business, and these costs get passed on to customers. In addition, they make it difficult for AT&T to introduce new technologies in a timely fashion.

What are some of the challenges of working with a large carrier such as AT&T?

It is difficult for individual AT&T customers to have an impact on the carrier's policy, service offerings or prices. One of ONE's greatest benefits is that it leverages the combined market power of AT&T customers and gives them a single, united voice to influence AT&T.

ONE provides a platform for our members to influence the development of new products and services and AT&T strategy and policy. ONE also has the individual contacts within AT&T to quickly resolve problems that transcend various product lines or divisional groups. This kind of relationship is invaluable for our members.

INTERNATIONAL NETWORKS

USER STRATEGIES, INTERNATIONAL SERVICES & REGULATION

World News

Japan's dominant domestic carrier, **Nippon Telegraph and Telephone Corp. (NTT)**, last week said it had advanced the timetable for a planned conversion of its public network to digital technology by one to two years.

Now the carrier says it plans to finish replacing all nonelectronic cross-bar switches with electronic switches supporting both digital and analog technology by March 1995.

Previously, this conversion was scheduled for completion by March 1996.

All switches are expected to be converted to digital technology by March 1998; the previous estimated completion date was March 2000.

All long-haul circuits are to support digital technology by March 1996, as originally planned.

The carrier also will stay with the current March 1993 deadline for converting to digital technologies its long-haul circuits running between major cities.

US West International Holdings, Inc., Millicom, Inc. and four Russian organizations recently said they have signed a letter of intent with the Soviet Union Ministry of Posts and Telecommunications to build and operate a cellular telephone network in Moscow.

The system will be one of two cellular telephone networks in Moscow and is expected to commence operations in the third quarter of this year.

Going global

Eastern Bloc membership in major satellite groups

Countries	International satellite groups			
	European Telecommunications Satellite Organization	International Telecommunications Satellite Organization	International Maritime Satellite Organization	Intersputnik (Soviet-operated)
Bulgaria	Application pending	Not member	Member	Member
Czechoslovakia	Application pending	Not member	Member	Member
Hungary	Application pending	Member	Not member	Member
Poland	Member	Not member	Member	Member
Romania	Member	Member	Member	Member
USSR	Not member	Not member	Member	Member
Yugoslavia	Member	Member	Member	Not member

GRAPHIC BY SUSAN J. CHAMPENY SOURCE: EUROPEAN COMMISSION, BRUSSELS, BELGIUM

Poland plans to improve international phone links

Upgrades nets to meet growing business needs.

By Barton Crockett
Senior Editor

WARSAW, Poland — Early this year, the government of Poland expects to cut over new local and international facilities that will vastly improve communications to the U.S. and within this city.

A new AT&T 5ESS international gateway switch, satellite earth station and digital microwave network will more than double the number of telephone lines linking Poland to the outside world and give users here full end-to-end digital connectivity to the U.S.

The enhancements will also dramatically improve communications in this city, where users are currently plagued by unreliable public net services supported by obsolete switches and decrepit cabling, making it extremely difficult to complete telephone calls.

"Right now, you're lucky if you can get a call into or out of the country," said David Batson, product manager for digital radio products at AT&T Network Systems Group in Andover, Mass. "But when this is all done, Poland will have some of the most modern public network technology in the world."

Batson works with a team of AT&T engineers who are installing the facilities as part of a contract with the country's Ministry of Posts and Telecommunications.

Focusing on business needs

The installation of new public net equipment is targeted at meeting the needs of business users in Poland, thereby aiding the country's transition to a free-market economy.

For example, one of the most critical needs Poland has now is foreign investment. Current public network services hamper po-

(continued on page 28)

Packet-switching fees under fire in Canada

Study from Canadian user group blames inflated rates on lack of competition in network arena.

By Barton Crockett
Senior Editor

RICHMOND HILL, Ontario — Packet-switching services in Canada can be as much as two times as expensive as comparable services offered in the U.S., according to a soon-to-be-released study obtained by *Network World*.

The study states that greater competition is needed in Canada to bring public packet-switching prices in line with U.S. rates, according to the Communications Competition Coalition, the user group that commissioned the research.

"Competition brings choice, innovative services and lower costs," said Monty Richardson, executive director of the user group, based here.

According to Richardson, the study rebuffs repeated assertions by Canada's dominant regional carriers that Canadian packet-switching services are less expensive than those in the U.S.

A spokesman for Telecom Canada, a consortium of Canada's dominant regional carriers based in Ottawa, said he could not comment on the study because he had not seen it.

The packet-switching study, "Canadian Packet Switching Rates Analysis," is scheduled to be publicly released by the Communications Competition Coalition within a few weeks, Richardson said.

The coalition is a group of about 40 user companies that banded together in January 1990 to advocate greater competition in Canada's network markets. Members include the Canadian Imperial Bank of Commerce, General Motors Corp. of Canada and Sears Canada, Inc.

AT&T vs. Telecom Canada

The Communications Competition Coalition's packet-switching study states that Canada's packet-switching prices are higher than U.S. rates. This was done by comparing Telecom Canada's pricing for its Datapac packet service with prices charged by AT&T for its Accunet Packet Service.

The study found that AT&T charges substantially less for the transmission component of its packet services than Telecom Canada does for its services. Depending on the distance traveled and the location of a user's end nodes, Telecom Canada's price per kilopacket can be as much as 17 times more than AT&T's price per kilopacket (see graphic, page 28).

"Competition brings choice, innovative services and lower costs," Richardson said.

▲▲▲

On the local access side, however, Telecom Canada's packet rates fare better than its U.S. counterpart's rates.

For example, Telecom Canada's charge for dedicated access to a 2,400 bit/sec port on the

(continued on page 28)

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Packet-switching fees under fire in Canada

continued from page 27

Datapac network is $204 per month.

By contrast, users in the U.S. have to pay AT&T and their local exchange carrier about $412 per month for dedicated 2,400 bit/sec access to the Accunet Packet Service.

Overall, Telecom Canada's rates for delivering an end-to-end packet-switching service can range from 40% below AT&T's rates to 2½ times higher, Richardson said. Generally, Telecom Canada's prices are less expensive than AT&T's when packet traffic is carried over short distances and higher than AT&T's when traffic is carried over long distances.

Public packet service pricing: Canada vs. U.S.

Mileage bands	Price per kilopacket							
	Telecom Canada By area*, assuming $1 Canadian equals $.85 U.S.						AT&T	
	From Grade 1 to Grade 1	From Grade 1 to Grade 2	From Grade 2 to Grade 2	From Grade 1 to Grade 3	From Grade 2 to Grade 3	From Grade 3 to Grade 3	Peak hours	Off-peak hours**
0-100	$.34	$.86	$1.48	$1.45	$2.07	$2.66	$.75	$.38
101-400	$.55	$1.45	$2.84	$2.97	$3.60	$4.51	$.75	$.38
401-1,000	$.90	$1.98	$3.60	$3.51	$4.50	$4.51	$.75	$.38
More than 1,000	$1.53	$2.98	$4.73	$4.05	$5.45	$5.95	$.75	$.38

*Telecom Canada rates vary by city, which are classified by grades.
**6 p.m. to 7 a.m. Monday through Friday, and all day Saturday and Sunday.

GRAPHIC BY SUSAN J. CHAMPENY

SOURCE: COMMUNICATIONS COMPETITION COALITION, RICHMOND HILL, ONT.

But in the vast majority of instances, Telecom Canada's rates are more expensive than AT&T's rates, Richardson said.

He also complained that Telecom Canada's tariffs are illogical and confusing.

Wacky tariffs

For example, Richardson said there is no justification for Telecom Canada to charge different usage rates for service in various cities.

These distinctions can create situations where users can be forced to pay double the cost of their public packet service simply by moving across the street from the outskirts of a large city to a suburb.

Richardson said such cost differentials bear no relation to provisioning costs. He explained that these differences are based on an antiquated cost-justification formula worked out in the 1970s that is no longer valid.

Telecom Canada's city-by-city pricing approach is not copied by U.S. carriers, which charge users the same price per kilopacket no matter where traffic originates and terminates, Richardson said. He also complained that Telecom Canada should not charge distance-sensitive rates. ◘

Poland to improve international links

continued from page 27

tential investors, who are often constrained by the enormous difficulty they face completing phone calls to and from the country.

The installation of the new 5ESS switch here will make international calling easier by replacing an antiquated, analog international gateway switch with the newest digital technology.

The 5ESS will be connected via a high-capacity microwave link to a digital satellite earth station in Psary, Poland, that will bounce signals off an International Telecommunications Satellite Organization satellite to and from North America.

Even though Poland does not belong to INTELSAT, it has contracted to use INTELSAT facilities (see graphic, page 27).

Twice as many circuits

According to Wes Warschol, a manager in AT&T's international network engineering division in Morristown, N.J., who also is working with the team of AT&T engineers involved in the Poland installation, the new international facilities initially will more than double the 200 international phone circuits now supporting switched communications between the U.S. and Poland. This digital technology easily could be upgraded to support more circuits in the future, he added.

Batson said the new international gateway switch and network should be up and running within a few weeks.

Local communications will be improved by the installation of a new digital microwave overlay network that will link up with private branch exchanges in most of the major hotels, businesses and government offices in Warsaw.

In addition, the microwave network will be linked to the 5ESS international gateway switch. This means that users here will be able to obtain full digital connectivity to the U.S.

Batson said the digital microwave overlay network should be up and running by March. ◘

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PRODUCTS & SERVICES

THE LATEST OFFERINGS FROM VENDORS AND CARRIERS

First Look

Asante adapter links Macintosh to Ethernet

Asante Technologies, Inc. last week unveiled a network controller card and three media adapters that link Apple Computer, Inc. Macintosh LC models onto an Ethernet local-area network.

The **FriendlyNet LC Network Controller Card** is a 32-bit Ethernet controller card that plugs directly into the Macintosh LC's 68020 Processor Direct Slot, which enables the user to seat the controller directly on the main processor board. The backplane of the controller supports Apple's new Ethernet Cabling System.

Asante unveiled three Ethernet media adapters: the **FriendlyNet Multi-port Adapter, FriendlyNet 10T Adapter** and **FriendlyNet Thin Coax Adapter.**

The FriendlyNet Multi-port Adapter comes with three ports to support connection of thick coaxial wiring, thin coaxial cabling or unshielded twisted-pair wiring.

The FriendlyNet 10T Adapter provides a single connection to unshielded twisted-pair wiring; the FriendlyNet Thin Coax Adapter attaches to thin coaxial wiring.

Bundled with a FriendlyNet Multi-port Adapter, the FriendlyNet LC Network Controller Card costs $399. Bundled with a FriendlyNet 10T Adapter or FriendlyNet Thin Coax Adapter, the network card costs $349. Sold separately, the FriendlyNet Multi-port Adapter is priced at $179. The FriendlyNet 10T and FriendlyNet Thin Coax media adapters cost $149 each.

Asante Technologies, Inc., 405 Tasman Drive, Sunnyvale, Calif. 94089; (408) 734-4844.

RAD Data offers fiber-optic modem

RAD Data Communications recently rolled out the **Fiber Optic Modem (FOM)-8,** a fiber-optic modem that conforms to the CCITT V.54 standard for loop-back testing. The FOM-8 is a stand-alone unit that transmits data at 19.2K bit/sec and can operate in a private net at distances up to two miles.

Available now, the FOM-8 is priced at $300.

RAD Data Communications, 151 W. Passaic St., Rochelle Park, N.J. 07662; (201) 587-8822.

Plexcom's LAN bridge, router bows

By Jacqueline Emigh
Staff Writer

SIMI VALLEY, Calif. — Plexcom, Inc. recently introduced a bridge/router that links local Ethernets and routes Transmission Control Protocol/Internet Protocol data across LANs.

The company's PlexBridge/PlexRouter 8029 Ethernet Bridge/Router enables users to divide a single large Ethernet into subnets for performance and security reasons and to route TCP/IP data among users on the different segments.

The unit comes with two RJ-45 ports for connection to local-area networks supporting the IEEE 10BaseT standard for running Ethernet over unshielded twisted-pair wiring. It also has two attachment unit interface ports.

Each PlexBridge/PlexRouter 8029 Ethernet Bridge/Router also has a serial communications port for remote or local connections to Plexcom's PlexView net management software, which runs on a personal computer.

Like PlexView, the PlexBridge/PlexRouter 8029 Ethernet Bridge/Router supports the Simple Network Management Protocol. The bridge/router also supports the Spanning Tree Protocol and the Routing Information Protocol.

Plexcom President Al Pocrass said the company will eventually add support for Novell, Inc.'s Internetwork Packet Exchange (IPX) protocol, although he offered no firm date.

In routing mode, the unit can filter 25K packet/sec and forward 8K to 12K packet/sec.

Pocrass said that as many as seven PlexBridge/PlexRouter 8029 Ethernet Bridge/Routers can be housed in a rack enclosure. The bridge/routers can also be housed in a wiring hub that enables users to link concentrator cards and other internetworking devices.

Available now, the PlexBridge/PlexRouter 8029 Ethernet Bridge/Router costs $3,595. The firm will also sell the product separately as the PlexBridge 8029-3 bridge or the PlexRouter 8029-5 router at $3,095 each.

For more information, write to Plexcom at 65 Moreland Road, Simi Valley, Calif. 90365, or call (805) 522-3333.

TIU allows for control of microwave radios, CPE

BLOOMINGDALE, Ill. — Motorola Microwave recently unveiled a device that enables its Telescan 1000 network management system to monitor and control remote microwave radios and other customer premises equipment.

The introduction of its Telescan Interface Unit (TIU) enables Motorola Microwave to provide users with centralized control of any analog or digital microwave radio, multiplexer or a variety of other premises equipment.

Until now, the Telescan 1000 software, which runs on a personal computer, was only capable of monitoring traffic on the company's UltraStar 2 and UltraStar 6 long-haul digital microwave radios. To manage other types of devices at remote sites, net personnel had to take readings from the individual devices.

The new TIUs are stand-alone units that are installed at remote sites in a microwave network, fitting inside a wiring closet alongside other equipment.

Microwave radios, multiplexers and channels banks are wired into the backplane of each TIU. Every TIU comes with 32 digital inputs to gauge operating conditions of attached devices.

The units also have 20 voltage inputs and six counter inputs for attachment of premises equipment.

Also, each TIU is equipped with 16 output ports to download commands from the network management software to devices such as multiplexers.

The Telescan 1000 Network Management System and the new TIU exchange information over a service channel, or sideband channel, on the microwave network. In the event that one TIU passes alarm data to another, the signal must be regenerated by the receiving TIU and passed on to the receiving station. According to Mike Guerin, product planner at Motorola Microwave, this process screens out interference on the service channel.

Motorola Microwave declined to provide pricing information but said costs vary according to network configuration.

For more information, Motorola Microwave can be reached at 171 N. Covington Drive, Bloomingdale, Ill. 60108, or by calling (800) 545-0334.

Device ties disparate gear to token rings

Microcomputer-based communications processor supports SDLC, BSC, asynchronous equipment.

By Jacqueline Emigh
Staff Writer

IRVINE, Calif. — Sync Research recently announced a communications processor that provides token-ring local-area network connections for terminals, cluster controllers and other installed devices supporting traditional SDLC, BSC and asynchronous protocols.

The SNA Network Access Controller for Token Ring (SNAC/TR), a multiport AT-bus-based communications processor, piggybacks multiprotocol traffic on token-ring nets.

Besides providing a way to integrate disparate devices into token-ring environments, SNAC/TR will enable LAN workstations to operate as peer nodes with microcomputers attached to remote LANs, sharing files and swapping electronic mail, according to Lynn Nye, SNAC/TR product manager.

By comparison, workstations on LANs that are linked by Systems Network Architecture gateways supporting Synchronous Data Link Control could only emulate IBM 3270 terminals to access remote hosts. That prevented LAN workstation users from communicating on a peer basis with LAN nodes across the network, he said.

The SNAC/TR setup also reduces processing demands on front-end processors at the host site, greatly decreasing the amount of remote polling of cluster controllers because the front-end processor polls only the SNAC/TR and not each controller, he added.

In addition, the setup facilitates centralized network management by letting users run IBM NetView and NetView/PC to track the condition of LAN devices and attached cluster controllers.

SNAC/TR units reside at remote sites and sit between cluster controllers and the token-ring LAN. Each SNAC/TR supports the attachment of as many as 16 cluster controllers and provides a single connection to a 4M bit/sec or 16M bit/sec token-ring LAN.

The unit communicates with attached cluster controllers at speeds up to 19.2K bit/sec and provides downstream terminals with host emulation services. On the host interface side — the token-ring connection — the SNAC/TR responds to polls locally, ensuring that controller connections are not congested with polls from remote front-end processors.

The SNAC/TR will provide token-ring access to a variety of terminals including SDLC, Binary Synchronous Communications, Unisys Corp.'s UTS, asynchronous and remote job entry terminals.

Use of a SNAC/TR in a bridged token-ring environment also enables personal computers on the net to operate at LAN speeds rather than slower SDLC line speeds, Nye said.

> The SNAC/TR will provide token-ring access to a variety of terminals.

▲▲▲

Without a SNAC/TR in a bridged token-ring environment, users with cluster controllers and token-ring networks at the same site would share a modem connection to an SDLC network and communicate through a front-end processor to an IBM host.

Dollar-Dry Dock Bank, in White Plains, N.Y., will begin beta-testing the SNAC/TR in February. The user plans to utilize the device to integrate existing SNA devices with a new 16M bit/sec token ring running Novell, Inc.'s NetWare 386, according to Bob Greenstein, vice-president of telecommunications.

The bank is upgrading its network from a slow-speed point-to-point SNA to a high-speed distributed LAN running Novell's NetWare 286 SP network operating system.

The network will support an array of protocols including SNA, source routing and Novell's Internetwork Packet Exchange/Sequence Packet Exchange (IPX/SPX).

SNAC/TR is scheduled to ship during the second quarter of 1991 at a starting price of $5,000.

For further information, contact Sync Research at 7 Studebaker, Irvine, Calif. 92718, or by calling (800) 275-7962.

OPINIONS

NETWORK MANAGEMENT

BY HOWARD FRANK

Data management, not products, is key to success

Network managers must recognize that in supporting today's network, security and access control are critical, and standards and procedures are essential. In addition, the business of the organization, as represented by end-user support, must take precedence.

Proper planning, monitoring, control and administration of a network requires timely and accurate data about the network. Therefore, data and information management is central to the network management problem.

Network managers must maintain accurate inventory records of network configurations (equipment, circuits and connectivity), reference data (users, phone numbers, locations, vendors, points of contacts and directories) and work data (service requests, change requests and monitored disruptions). It's impossible to plan, design, administer, control or maintain a network without knowing what is in place, where it is, who is responsible for it and how much it costs.

> Without appropriate management procedures, products provide little value.

Network management can be enhanced by the intelligent use of products, tools and systems. However, technology has not yet produced a single integrated family of products to support an extensive global network. Therefore, effective network management requires the analysis of existing systems and procedures with the goal of improving manual processes and determining areas where existing products can be applied to automate these processes.

Network management products can be grouped into three categories:

- **Planning and design products** handle network design, configuration change analysis and performance simulation.
- **System administration products** address the functions of inventory record keeping, problem reporting, corrective actions and review, work order generation, user assistance and coordination, as well as billing and chargeback.
- **Monitoring and control products** measure technical performance parameters (traffic, error rates, delay and blocking), status of network components and end-user devices (switches and lines), and record cost and billing data.

Successful implementation of network management products requires rigorous data management and clearly defined configuration control policies and procedures. Products or tools only expedite the process of net management. Without appropriate management procedures, tools and products provide little additional value.

Just a few years ago, network management was the province of a handful of vendors attempting to sell systems to monitor network performance and generate alarms. Today, net management is accepted as the term describing a new discipline.

Management is at the heart of the process. Only management systems that address human, organizational, procedural, and hardware and software factors can improve the performance of global networks.

While recognizing the problem is the first step, dedication and hard work are subsequent factors in building a more manageable platform to fulfill networking's greatest promise — furthering the strategic goals of the organization. ◘

Frank is chairman of Fairfax, Va.-based Network Management, Inc., one of the largest local-area and wide-area network systems integrators in the U.S.

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West Coast Bureau
2088 Union Street, Suite 2
San Francisco, Calif. 94123

Washington D.C. Bureau
Anita Taff — Bureau Chief
(202) 879-6744

Ellen Messmer — Correspondent
National Place
1331 Pennsylvania Ave. NW, Suite 505
Washington, D.C. 20004
(202) 879-6752

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Network World
161 Worcester Road
Framingham, Mass. 01701
(508) 875-6400
MCI Mail — 390-4868
FAX: 508-820-3467

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USER ADVISORY PANEL

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Boeing Computer Services

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Kenneth Phillips
Vice-President, Office of Telecommunications Policy
Citicorp
Chairman, Committee of Corporate
Telecommunications Users

William Pomeroy
Director of Telecommunications Public Policy
International Communications Association

Michael Toto
Vice-President, Corporate Telecommunications
Johnson & Higgins
President
Association of Data Communications Users

Stanley Welland
Manager, Corporate Telecommunications
General Electric Co.

EDITORIAL

Awaiting an explanation for the AT&T cable break

Natural disasters can cripple cities, and there isn't much humans can do to prevent it. A fiber-optic cable break can have nearly the same effect, but there is definitely something that can be done in that instance.

Users should be asking what could have been done to prevent the disastrous consequences of AT&T's cable break near New York on Jan. 4: Flights at three major airports were either delayed or cancelled, bank networks were crippled, commodities exchanges were forced to close for several hours and 60% of all long-distance calls in the area were blocked. Also, they should ask what can be done today and in the future to prevent similar events.

Optical fiber, being a thin strand of brittle glass, will break if it is mishandled. But fiber circuits can be backed up, and certainly the primary trunk lines of the major carriers should have been backed up long ago.

Concerning the most recent break, which affected networks mainly in New York City and Newark, N.J., AT&T told *The New York Times* that it has backup installation plans in the works now and that if a similar cable break were to occur next year, the circuits will be backed up.

But users should be asking why these actions weren't taken earlier and when fiber routes to other major cities will have redundancy.

What's more, the Federal Communications Commission should be seeking answers. The FCC carries the legal burden of ensuring that the U.S. telephone network is fail-safe.

And these questions shouldn't be asked of AT&T alone. Users and the FCC should ask MCI Communications Corp. and US Sprint Communications Co. for detailed plans of how each of these carriers is providing redundancy in its network.

About a year ago, after the great national AT&T network outage, AT&T's top management apologized profusely and offered its users free telephone calls on Valentine's Day as compensation for the mishap.

Once again, users affected from this recent outage should get fair compensation.

But even more importantly, customers should get some detailed answers to their questions.

It's not enough to be reassured that the problem won't happen in the future.

Perhaps if pressured on all fronts by users and the FCC, then AT&T, MCI and US Sprint might offer some answers. Users have a great deal more clout than they realize. They should exercise it in this circumstance. ◘

OPINIONS

IMAGE-BASED COMMUNICATIONS

BY JOHN MCQUILLAN

Image technology will revolutionize networking

The early 1990s will be the era of image-based communications. Many organizations are now planning to capture paper correspondence on-line for cheaper storage, more rapid and accurate retrieval and more timely distribution.

This process has been pioneered in financial service companies such as banks and brokerages, and will now extend to credit card companies, airline reservation systems and other organizations that require high-quality, rapid networking.

Image transfer is the outgrowth of several ongoing technological developments. With the proliferation of personal computers and high-end workstations, users have grown accustomed to manipulating graphics and images at their desks.

Likewise, electronic mail use has expanded. Image transfer in this context is sometimes referred to as compound document exchange — a mixture of text messages and attachments that may include program files, images scanned from external sources and graphical displays of computer data.

Image networking's role in customer service and support is attractive to user companies seeking a competitive edge. Powerful workstations enable customer service representatives to access image data bases, such as customers' correspondence, and such diverse information as training manuals and documents from suppliers.

Leading-edge user companies will use image-based communications in three ways. In cases involving desktop publishing and facsimile or image servers on local-area networks, image will not be a large fraction of the total communications, but instead will be seen as an augmentation to communication from many different sources. One step up from this application is dedicated image capture, which will generate more traffic but from a smaller set of devices.

Finally, some specialized organizations, such as banks and credit card companies, will move to a completely paperless operation. Here, large data transfers of many megabytes per image will be commonplace. However, in most situations, there will be even fewer sources and destinations of such traffic flows.

> Image networking's role is attractive to users seeking a competitive edge.
>
> ▲▲▲

Today, image communications requires four different devices: a copier, fax machine, laser printer and scanner. Over the next four years, however, these four types of products will be consolidated into a new generation of digital image servers connected to networks.

Some of these products are on the market today. Electronic-still cameras from Canon, Inc. and Sony Corp. are available that may eventually replace familiar 35mm film systems. Eastman Kodak Co. now has a system for storing 100 photographic images on a compact disc. This technology, called Photo CD, is interesting to computer and software developers such as Adobe Systems, Inc., which is working closely with Kodak to develop a color specification called PhotoYCC. PhotoYCC is a standard way of defining colors in an image.

IBM's offering, called ImagePlus, presents distributed processing with workstation image capture and manipulation; mainframes act as image servers.

Digital Equipment Corp. offers demand printing and integrated imaging. Xerox Corp. recently introduced a high-end electronic copier and photo typesetter called Docutech, which many people in the industry say will revolutionize the high-end printing business.

In another interesting indication of things to come, Canon recently introduced its Model 500 color laser copier, which uses dry color reproduction technologies, integrating a scanner, printer and copier. Driven by a variety of computer hardware and software, including Adobe's PostScript, this device can produce publication-quality color printing on the network.

While these products are brand-new and still quite expensive, they will eventually have a major impact on networking. Transmitting images requires many more bits than character-oriented messages, but they don't have to be delivered to match traditional interactive response time requirements. Very often, they need to be distributed to multiple locations, in which case, centralized servers make a great deal of sense. Traffic flows, distribution and patterns are all likely to change.

Over time — perhaps by 1995 — laser printers may outnumber copiers. Stand-alone copiers will become as unusual as stand-alone typewriters have become today. Likewise, because of their cost and complexity, almost all color copiers will be integrated with scanners and printers.

Thus, the color fax/printer/copier is likely to be a network device, a shared peripheral supported by a server. No doubt this kind of high-end color imaging system will be the baseline for office imaging and printing by 1995. The arrival of this technology will revolutionize networks as we know them today. ◘

McQuillan is president of McQuillan Consulting in Cambridge, Mass. He assists users and vendors in planning communications systems.

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TELETOONS

BY FRANK AND TROISE

I'm sorry, Ralph... not even the Networking Fairy can pull this one out of the fire!
BPP!
PP!

LETTERS

More on motors

In his comments on my "Alligators in the Swamp" article ("Zapping the alligator," *NW*, Dec. 17, 1990), Cameron Snow indicated correctly that three-phase motors are not commonly found on personal computer local-area networks. They are found on interconnected networks primarily in host computers, and it is not unusual to see a host configured as a server.

The rotation direction of a three-phase motor is determined by the connection sequence of the phasing. If the phases are switched, the reversed rotation will destroy some disk drives. Seeing it happen once was enough to convince me to learn the electrical characteristics of my equipment and not to assume that conditions were the same for two different units.

Mr. Snow also commented on motors not generating electricity. One common method of changing single phase to three-phase current, used where utility three phase is not available, involves using a three-phase motor as an autogenerator. Motor generators have been widely used as power conversion units in the mainframe arena.

Ira Hertzoff
President
Tholian (Holdings), Inc.
Columbus, Ohio

Critics singing new song

I found the article "Net execs lacking business savvy face credibility gap" (*NW*, Nov. 26, 1990) ironic. Wasn't it just a few years ago that network managers were being chastised for being overly cost-conscious?

Wasn't the rap on telecommunications managers and network managers that they managed only the expense side of the profit/loss statement and were neither far-

(continued on page 47)

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Technologies
of the
future:

SONET

SONET set to soar before 21st century

CONTINUED FROM PAGE 1

puter Services Co. has reportedly put out a request for proposal for SONET gear.

But what is SONET? Is its speed the only thing that makes it important?

Actually, it isn't. SONET's importance is at least twofold. As a standard, SONET's main intent is to be compatible with existing telecommunications standards and drive down the price of equipment for the telephone companies. And it may well do so when the phone companies begin installing SONET gear, which will probably start with the long-distance carriers late this year.

As a technology, SONET's outstanding innovation is a new approach to time-division multiplexing.

This is a breakthrough in efficiency. Just as modems are an indirect way of transmitting computer data because they have to turn digital coding into frequencies to transmit across an analog net, today's multiplexers may be looked back upon as treating data relatively inefficiently.

That's because most multiplexers and telephone company channel banks require the demultiplexing and remultiplexing of the entire signal just to access a piece of information that is addressed to the node.

For example, say T-1 Multiplexer B receives data on a single T-1 circuit from T-1 Multiplexer A and passes the data on to Multiplexer C. In the signal received, for example, only a single DS0 channel (64K bit/sec) is addressed to Node B. The rest will pass on to Node C and further on into the network.

To remove that DS0, Multiplexer B must demultiplex every bit of the 1.544M bit/sec T-1 signal, remove the data and remultiplex every bit. This is true for most customer premises multiplexers. A few proprietary T-1 multiplexers allow for drop-and-insert capability — meaning that only part of the signal has to be demultiplexed and remultiplexed — but this equipment will not communicate with other vendors' gear.

The high-speed Synchronous Optical Network standard offers a new approach to multiplexing the networks of the '90s and beyond.

SONET offers a standard drop-and-insert capability — not merely for DS0s but for channels of at least 50M bit/sec. SONET's innovative pointer format and its synchronous multiplexing technique, which requires that each node be timed to a central source, are the approaches that lead to this capability.

What else is important about SONET? It is the only standard way of converting be-

(continued on page 40)

Borsook is a free-lance writer based in New York.

(continued from page 39)

tween electrical and optical communications.

Thus, users of T-3 multiplexers today are currently using nonstandard, proprietary techniques for translating their signals to optical pulses.

Then, of course, there is speed. SONET allows for speeds ranging from a low of 51.84M bit/sec to a theoretical upper limit of 13.2G bit/sec.

And these speeds are not only for dedicated circuits. Largely because of its new multiplexing mechanism, SONET has the capability of allowing users to order enormous chunks of bandwidth on demand.

Finally, SONET will allow new network configurations, in particular, ring networks. Such rings are likely to be more fail-safe than today's mesh networks.

Although there is competition between SONET, a circuit-switching technology, and high-speed packet-switching techniques such as Asynchronous Transfer Mode, the two need not be exclusive. Asynchronous Transfer Mode packets, or those of the Fiber Distributed Data Interface local-area network or the Switched Multimegabit Data Service (SMDS) metropolitan-area network, can travel over SONET circuits. Indeed, the FDDI standards committee recently began work on an FDDI-to-SONET interface.

How SONET works

SONET's official name, given by the Consultative Committee on International Telephony and Telegraphy, is the Synchronous Digital Hierarchy (SDH), by which the standard is more commonly known outside the U.S. Part of the SDH specification is the universal Network Node Interface (NNI), which specifies the link between transmission facilities and a network node. Standards written under NNI explain how to make existing network equipment compatible with SONET.

NNI thus prescribes how an electrical signal can emerge from a telephone switch, be multiplexed into the SONET format, be translated into optical pulses and be sent across a network.

Work on the SONET specifications is proceeding in phases. The first, Phase I, addressed hardware specifications and optical characteristics, and was formally approved by the CCITT in December 1990. Phase II is under way and is expected to be completed late this year. This second phase mainly deals with telephone company matters, including operations, provisioning, administration and management.

Phase II also includes proposed connections between SONET and broadband ISDN. This may prove controversial because European proponents of broadband ISDN want it to travel as a baseband signal over an unswitched fiber circuit and the North American position is that it should travel over SONET circuits.

One of SONET's strengths is the clear division the standard makes between the information it carries (the payload, in SONET parlance) and its overhead. Most of the time, SONET network equipment is not concerned with the payload it carries. But overhead is of vital interest to the equipment.

Therefore, this separation of powers simplifies network management tasks and allows SONET networks to transport payloads that are not synchronized to one another by a common clock (thus remaining mutually asynchronous) while preserving the flexibility and benefits of synchronous multiplexing.

Like the Open Systems Interconnection model, SONET's capabilities have been mapped into layers. But there is no correspondence between OSI's seven layers of functionality and SONET's layers.

There are only four layers to SONET: its lowest level, the physical layer, called the photonic layer; the section layer, which creates the basic SONET frames, converts electronics to photonics and has some monitoring capabilities; the line layer, which is responsible for synchronization, multiplexing of data onto the SONET frames and protection switching; and the path layer, which creates the SONET pointers and is ultimately responsible for the transport of data at the appropriate signaling speed.

Details of the photonic layer include the type of permitted fiber — single-mode, 125-micron fiber with a 6- to 10-micron core. The fiber may be either conventional glass, optimized for transmissions at the 1,310-nanometer light frequency, or dispersion-shifted fiber, optimized for transmissions at 1,550 nanometers. Also detailed are the required minimum powers and dispersion characteristics of the lasers to be used and the required sensitivity of the receivers.

Although the SONET standard refers only to fiber, work is under way to allow the higher levels of SONET to travel over

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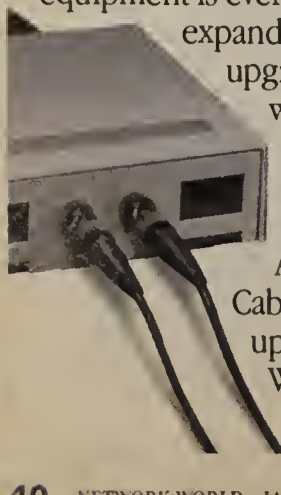

other media. There are nonstandard interfaces between SONET's slowest speed electronic signals, Synchronous Transport Signal Level 1 (STS-1), which has a data rate of 51.84M bit/sec, and digital microwave. There also have been proposals for a standard to allow the transmission of STS-1 for short distances over coaxial cable pairs. SONET optical repeaters operate at the photonic and section layers by converting signals from optical to electrical, and then regenerating, reframing and resending these signals.

SONET's structure

The basic SONET building block is the STS-1 frame, which, like a T-1 frame, is transmitted every 125 microsec. However, a SONET frame contains more than 30 times the data of a T-1 frame.

The STS-1 frame can be depicted as a matrix with 90 columns and nine rows. Each element of the frame is an 8-bit byte; thus, each frame consists of 6,480 bits. STS-1 transmission is done row by row and left to right until all bytes are sent.

When STS-1 electrical signals are converted to optical signals, they are called Optical Carrier Level 1 (OC-1) signals. Each higher data rate in the SONET fiber hierarchy is defined as a multiple of OC-1, with SONET data rates having been defined as high as OC-48, or 2.4G bit/sec. Each OC level above OC-1 is created by multiplexing STS-1s, with no byte or bit stuffing allowed in the standard.

SONET has been designed to multiplex signals from 64 DS0s to SONET's theoretical upper limit.

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The first three bytes in each STS-1 row are dedicated to section and line overhead. The remaining 87 bytes carry the STS-1 Synchronous Payload Environment (SPE), the user data content of the signal. The first column of the SPE is dedicated to path overhead. Not all columns in the payload must be fully occupied; some may be blank (see Figure 1, page 47).

In addition, SONET contains data communications channels. These seemingly misnamed structures do not work as user transmission channels at all; instead, they send alarm, maintenance, control, monitor and administrative information between elements in a SONET network and to network management devices. Data communications channels take up 192K bit/sec in each SONET repeater section and 576K bit/sec for an optical line.

SONET multiplexing

SONET has been designed to multiplex signals from DS0s to SONET's theoretical upper limit. Specific SONET equipment definitions thus far have only been made to OC-48. Composite signals from multiple STS-1 frames are created by byte-interleaving and aligning the involved frames.

The multiplexing of STS-1 frames requires the first three overhead bytes of every column of the line and section overhead bytes in the first STS-1 frame in multiplexed signal. The remaining overhead bytes in the rest of the STS-1 frames are not used. The SONET signal is then scrambled to remove continuous strings of ones and zeros and to allow receiver clock recovery. Finally, it is converted into optical format for transmission over fiber.

For subrate multiplexing, SONET SPEs can be broken down into four Virtual Tributaries (VT). VT1.5 corresponds to 1.544M bit/sec DS1; VT2 corresponds to the 2.048M bit/sec Conference Europeenne des Postes et Telecommunications rate, CEPT-1; VT3 corresponds to 3M bit/sec Digital Service (DS)-1C; and VT6 corresponds to 6M bit/sec DS-2. SONET's nine-row format can allow for both North American and European signals: VT1.5 is carried in three SONET columns or 27 bytes; VT2 is carried in four SONET columns or 36 bytes; VT3 is carried in six SONET columns or 54 bytes; and VT6 is carried in 12 SONET columns or 108 bytes.

An STS-1 payload contains seven nine-row by 12-column VT groups. Each VT group can carry four VT1.5s, three VT2s, two VT3s or one VT6. Different VTs can be carried in a single STS-1 payload, but VTs may not be mixed within a group.

Two types of SONET mappings have been defined: SONET asynchronous and SONET bit-synchronous. SONET asynchronous mappings create a DS1, derived from any clock source as a bulk payload to be transported between points. This requires minimum timing consistency between VTs and the SONET network clock.

Two of the SONET synchronous mappings establish a common clock frequency between the payload and the transport system. Finally, two more SONET synchronous mappings provide visibility at the DS0 level. A fixed-clock frequency and a fixed phase are created based on a DS1 frame so that individual DS0 channels can be identified and cross-connected.

SONET pointers

STS-1 signals carry payload pointers in their line overheads. Payload pointers are SONET innovations that help to synchronize SONET networks and frame-align STS signals. Payload pointers eliminate the need for demultiplexing and remultiplexing, allow visibility into each payload and avoid unnecessary buffers and slips within SONET equipment.

SONET SPEs can float with respect to an STS-1 frame, beginning anywhere in STS-1

(continued on page 47)

Skeptics scoff at SONET

Recent months have seen plenty of good news for Synchronous Optical Network (SONET) technology. Many new SONET products have been introduced, and carriers have offered strong indications of support for the technology.

Nevertheless, skeptics say SONET may be too costly to pass local regulators' scrutiny.

"Trendy," scoffs Paris Burstyn, vice-president of telecommunications research at Business Research Group in Newton, Mass. "SONET is trendy. But digitizing networks is not cheap."

Because of the high cost of buying new equipment, Burstyn argues that the local exchange carriers will have difficulty throwing out their old, still serviceable, high-speed multiplexing equipment and installing the new gear that SONET specifies.

"Regulators will be asking if everyone in the rate base will benefit from the newly installed technology," Burstyn says.

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"Regulators will be asking if everyone in the rate base will benefit from the newly installed technology," he says. "And the answer will be no because [SONET] is not designed to benefit the people in the backwoods, who don't need it." Thus, Burstyn says he believes that SONET will be deployed but done so gradually.

There may be something to this view, but Burstyn's point about the backwoods was undermined recently when the Oxford County Telephone Co., located in Buckfield, Maine, announced that it would begin deploying a SONET network to connect six towns. That net is expected to be completed around the end of this year.

Nevertheless, several analysts, such as Paul Bernstein, senior analyst at Probe Research, Inc. in Morristown, N.J., share Burstyn's view that regulators will not be enthusiastic about SONET. State regulators may oppose the retirement of physical plant prematurely, he says, adding, "No one replaces copper if they don't have to."

According to Bernstein, there's a good case to be made for SONET on the basis of cost savings on the operations side, but the case has to be made to skeptical regulators.

However, in cities where the local carriers face stiff competition from such bypass fiber providers as Teleport Communications Group and Metropolitan Fiber Systems, Inc., regulators may be forced to allow the local exchange carriers to upgrade to SONET equipment to keep them from losing all fiber business to the competition.

The rationale of having the same standard for both carrier and customer premises fiber is a powerful one, argues Robert Davidson, product line manager for broadband and local-area networks at Middlebury, Conn.-based General DataComm, Inc. For services of 45M bit/sec and above "without SONET, you have to use the equipment specified by the carrier," he says.

Of course, this is only for the fiber-optic equipment. Once there has been a conversion between the optical fiber and the 900-ft-maximum electronic span that can carry T-3, users can select their own T-3 multiplexers.

But SONET-based user equipment eventually may cost less than T-3 multiplexers.

Davidson argues that because SONET multiplexers are going to be standard for both telephone companies and for end users — indeed, in some cases, they will be the same equipment — the cost of SONET multiplexers will in time decline in price to below the cost of T-3 multiplexers.

— *Paulina Borsook*

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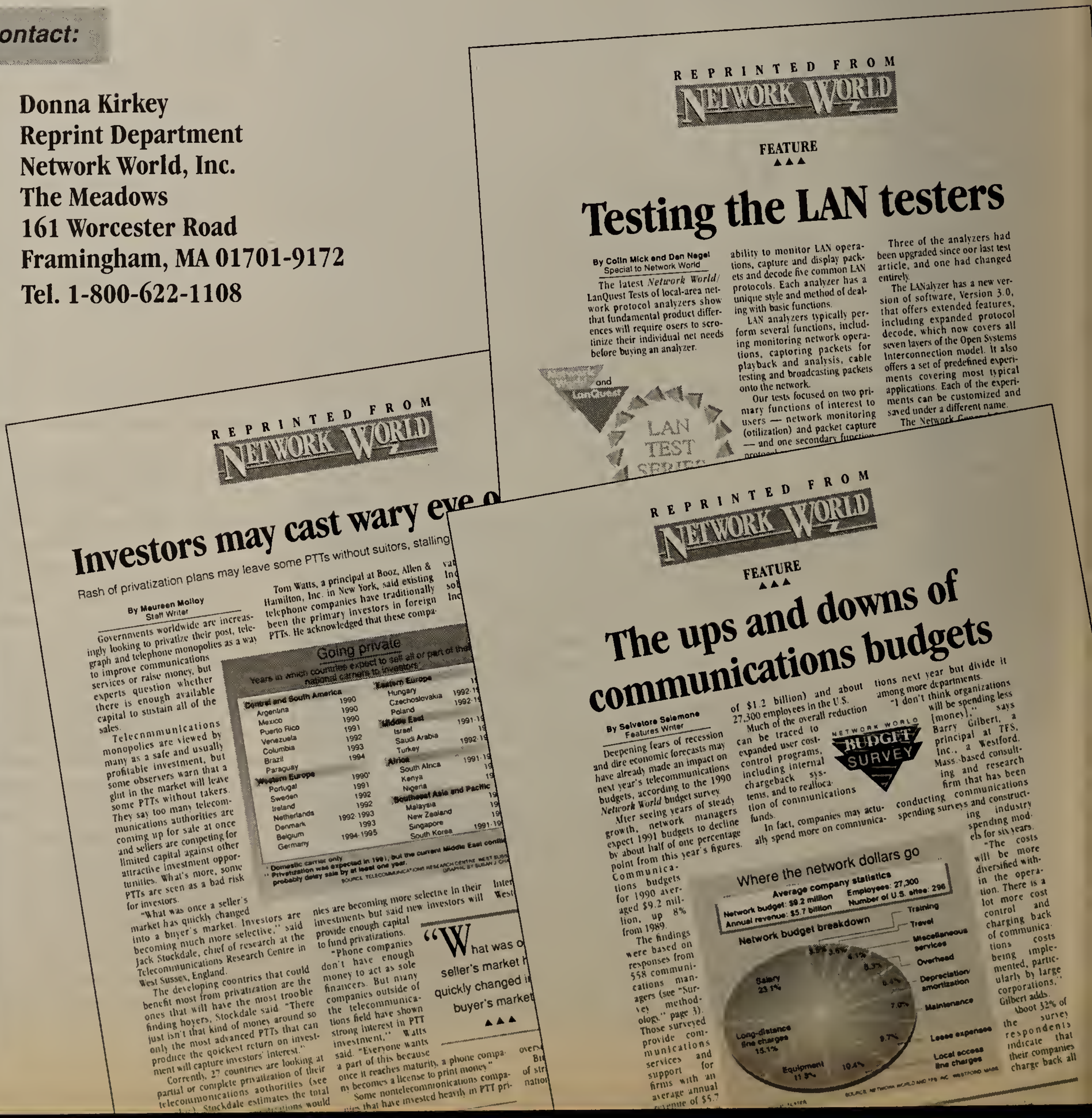

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FEATURE

Testing the LAN testers

By Colin Mick and Dan Nagel
Special to Network World

The latest *Network World*/LanQuest Tests of local-area network protocol analyzers show that fundamental product differences will require users to scrutinize their individual net needs before buying an analyzer.

ability to monitor LAN operations, capture and display packets and decode five common LAN protocols. Each analyzer has a unique style and method of dealing with basic functions.

LAN analyzers typically perform several functions, including monitoring network operations, capturing packets for playback and analysis, cable testing and broadcasting packets onto the network.

Our tests focused on two primary functions of interest to users — network monitoring (utilization) and packet capture — and one secondary

Three of the analyzers had been upgraded since our last test article, and one had changed entirely.

The LANalyzer has a new version of software, Version 3.0, that offers extended features, including expanded protocol decode, which now covers all seven layers of the Open Systems Interconnection model. It also offers a set of predefined experiments covering most typical applications. Each of the experiments can be customized and saved under a different name.

The Network

REPRINTED FROM NETWORK WORLD

Investors may cast wary eye o

Rash of privatization plans may leave some PTTs without suitors, stalling

By Maureen Molloy
Staff Writer

Governments worldwide are increasingly looking to privatize their post, telegraph and telephone monopolies as a way to improve communications services or raise money, but experts question whether there is enough available capital to sustain all of the sales.

Telecommunications monopolies are viewed by many as a safe and usually profitable investment, but some observers warn that a glut in the market will leave some PTTs without takers. They say too many telecommunications authorities are coming up for sale at once and sellers are competing for limited capital against other attractive investment opportunities. What's more, some PTTs are seen as a bad risk for investors.

"What was once a seller's market has quickly changed into a buyer's market. Investors are becoming much more selective," said Jack Stockdale, chief of research at the Telecommunications Research Centre in West Sussex, England.

The developing countries that could benefit most from privatization are the ones that will have the most trouble finding buyers, Stockdale said. "There just isn't that kind of money around so only the most advanced PTTs that can produce the quickest return on investment will capture investors' interest."

Currently, 27 countries are looking at partial or complete privatization of their telecommunications authorities (see

Stockdale estimates the total

would

Tom Watts, a principal at Booz, Allen & Hamilton, Inc. in New York, said existing telephone companies have traditionally been the primary investors in foreign PTTs. He acknowledged that these companies are becoming more selective in their investments but said new investors will provide enough capital to fund privatizations.

"Phone companies don't have enough money to act as sole financers. But many companies outside of the telecommunications field have shown strong interest in PTT investment," Watts said. "Everyone wants a part of this because once it reaches maturity, a phone company becomes a license to print money."

Some nontelecommunications companies that have invested heavily in PTT pri-

"What was o
seller's market h
quickly changed i
buyer's market

Going private

Years in which countries expect to sell all or part of the national carriers to investors

Central and South America	
Argentina	1990
Mexico	1990
Puerto Rico	1990
Venezuela	1991
Columbia	1992
Brazil	1993
Paraguay	1994
Western Europe	
Portugal	1990*
Sweden	1991
Ireland	1992
Netherlands	1992
Denmark	1992-1993
Belgium	1993
Germany	1994-1995
Eastern Europe	
Hungary	1
Czechoslovakia	1992-1
Poland	1992-1
Middle East	
Israel	1991-1
Saudi Arabia	1
Turkey	1992-1
Africa	
South Africa	1991-1
Kenya	1
Nigeria	1
Southeast Asia and Pacific	
Malaysia	1
New Zealand	1
Singapore	1
South Korea	1991-1

* Domestic carrier only
** Privatization was expected in 1991, but the current Middle East confli probably delay sale by at least one year.

SOURCE: TELECOMMUNICATIONS RESEARCH CENTRE, WEST SUSS

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FEATURE

The ups and downs of communications budgets

By Salvatore Salemone
Features Writer

Deepening fears of recession and dire economic forecasts may have already made an impact on next year's telecommunications budgets, according to the 1990 *Network World* budget survey.

After seeing years of steady growth, network managers expect 1991 budgets to decline by about half of one percentage point from this year's figures.

Communications budgets for 1990 averaged $9.2 million, up 8% from 1989.

The findings were based on responses from 558 communications managers (see "Survey methodology," page 3). Those surveyed provide communications services and support for firms with an average annual revenue of $5.7

of $1.2 billion) and about 27,300 employees in the U.S.

Much of the overall reduction can be traced to expanded user cost-control programs, including internal chargeback systems, and to reallocation of communications funds.

In fact, companies may actually spend more on communications next year but divide it among more departments.

"I don't think organizations will be spending less [money]," says Barry Gilbert, a principal at TFS, Inc., a Westford, Mass.-based consulting and research firm that has been conducting communications spending surveys and constructing industry spending models for six years. "The costs will be more diversified within the operation. There is a lot more cost control and charging back of communications costs being implemented, particularly by large corporations," Gilbert adds.

About 32% of the survey respondents indicate that their companies charge back all

Network World and LanQuest

LAN TEST SERIES

16M bit/sec token-ring adapters outpace Ethernet

By BRIAN MCGIFFERT

Excellent throughput results can give net managers new hope in their efforts to justify upgrading.

Speedy response, the basic reason for buying a fast local-area network, has been a problem with the 16M bit/sec token ring for about a year now. It goes without saying that a 16M bit/sec ring should be markedly faster than a mere 4M bit/sec ring.

But for a time, it wasn't. Tests conducted for the *Network World/* LanQuest Labs performance series almost a year ago (Feb. 12, 1990) showed that the top response time achieved with 16M bit/sec hardware available at that time improved response times by only 3% to 25% over those of a 4M bit/sec ring.

Not many potential users could justify buying a 16M bit/sec ring on that basis. But a year has passed and it's time to reconsider. The latest ring equipment shows considerable improvement, as compared with its predecessors.

The most recent tests conducted for the performance series show that the newest 16M bit/sec token-ring adapters can achieve a data throughput of almost 15M bit/sec under Novell, Inc.'s NetWare 286. This is more than 50% faster than the fastest Ethernet systems and three times faster than widely reported 16M bit/sec token-ring performance tests of a year ago.

The test data indicates that 16M bit/sec token ring has now pulled away from its 4M bit/sec

(continued on page 46)

McGiffert is manager of testing and analysis services for LanQuest Labs, a division of LanQuest Group in San Jose, Calif.

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A comparison of 4M/16M token-ring adapters

Figure 1

Manufacturer	Model	Data bus type	Supported data bus widths (bits)	Transmission rates supported (bit/sec)	NetWare 286 frame sizes (K bytes)			NetWare 286 FSPs at tested frame size	Warranty	List price
					Default	Supported	Tested			
Madge Networks, Inc.	Smart 16/4 AT Ringnode	ISA	8 and 16	4M and 16M	1	1, 2 and 4	1 and 4	2 and 5	5 years	$995
Olicom USA, Inc.	OC-3114 16/4 Token-Ring Adapter	ISA	8 and 16	4M and 16M	2	1, 2 and 4	2	3	1 year	$895
Racore Computer Products, Inc.	M8113 16/4 Token-Ring Adapter	ISA	16*	4M and 16M	4	1 and 4	4	2	1 year	$845
Thomas-Conrad Corp.	TC4045 Token-Ring Adapter/AT	ISA	8 and 16	4M and 16M	1	1, 2 and 4	2	3	2 years	$849
Olicom	OC-3128 16/4 Token-Ring Adapter	MCA	16	4M and 16M	2	1, 2 and 4	2	3	1 year	$925
Racore	M8114 16/4 Token-Ring Adapter	MCA	16	4M and 16M	4	1 and 4	4	2	1 year	$845

FSP = File Service Process ISA = Industry Standard Architecture MCA = Micro Channel Architecture

*Racore has a separate 4M/16M network interface card

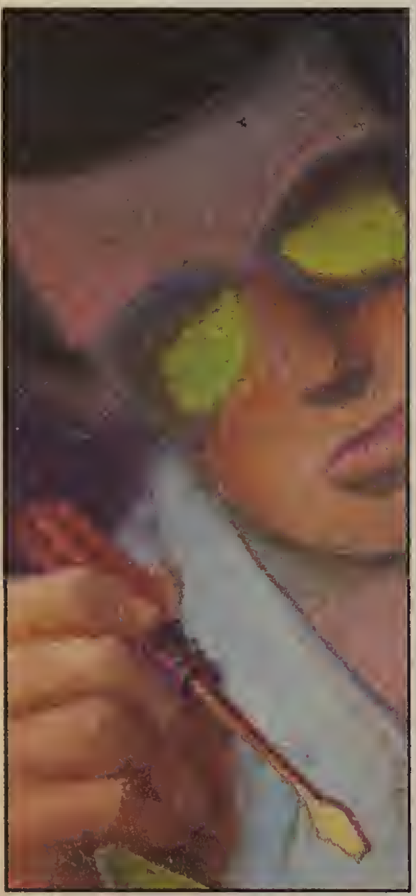
GRAPHIC BY SUSAN SLATER

SOURCE: LANQUEST LABS, SAN JOSE, CALIF.

(continued from page 43)

counterpart and generally surpasses Ethernet in performance. Adapters for both Micro Channel Architecture (MCA) and Industry Standard Architecture (ISA) — the familiar 16-bit IBM Personal Computer AT bus — proved capable of exceeding Ethernet's 10M bit/sec bandwidth.

The products tested were Madge Networks, Inc.'s Smart 16/4 AT Ringnode, Olicom USA, Inc.'s OC-3114 16/4 ISA and OC-3128 16/4 MCA Token-Ring Adapters, Racore Computer Products, Inc.'s M8113 16/4 ISA Token-Ring Adapter and M8114 16/4 MCA Token-Ring Adapter, and Thomas-Conrad Corp.'s TC4045 Token-Ring Adapter/AT (see Figure 1, this page).



Improvements in adapter drivers — the software that links the card's hardware to the network operating system — such as new versions that support larger block sizes were a major contributor to the performance gains noted in the tests. Another major factor was bus width; the 8-bit bus jumper setting available on many of the AT-style cards reduced performance by more than half in one series of tests.

The choice of bus architecture made little difference in the test results. Performance of ISA and MCA adapters from single vendors was similar in most tests.

Methodology

NetWare 286 was selected for these tests because it continues to be the most popular LAN operating system on the market.

Novell's Perform 3 adapter performance test was used for measuring network adapter performance. Perform 3 runs under many network operating systems, including NetWare 286 and 386, Microsoft Corp.'s LAN Manager, 3Com Corp.'s 3+Open, IBM's LAN Server and Banyan Systems, Inc.'s VINES.

We used Perform 3 Version 1.60 with the following test settings: 15-second timed intervals, block request sizes of 4.096K to 512 bytes, and a step size of 512 bytes.

Perform 3 measures the amount of data transferred from the server's random-access memory to each workstation within a predetermined number of seconds. Thus, Perform 3 measures network throughput without reading from or writing to the hard disk.

This is important because hard disks are typically much slower than network interface cards. Performance tests that rely on disk reads and writes are primarily testing hard disk performance since the hard disk would be a bottleneck. For this reason, Perform 3 is an excellent test for measuring aggregate throughput — the amount of data that moves through the server's adapter.

However, Perform 3 provides no indication of server CPU utilization or server memory usage, two indicators of adapter efficiency that could be helpful to users. Both of these factors affect overall network performance, and a better, but as yet unavailable, adapter test suite would measure both.

Two platforms were used as servers. For the ISA machines, we used a Compaq Computer Corp. DeskPro 386/33-110; for the MCA machines, we chose an IBM Personal System/2 Model 70-A21 — a 25-MHz Intel Corp. 80386-based machine. Both file servers had 8M bytes of RAM.

Twelve 8-MHz 80286-based Personal Computer AT clones were used as load workstations. The 12 were found to provide sufficient load to saturate the server's adapter in every case tested.

Whether eight or 12 machines were used, there was little difference in total network throughput, indicating that every network interface card/driver combination tested was performing at maximum capacity for that server. Thus, adding workstations would not have changed peak performance numbers.

IBM Type 1 cable, commonly called shielded twisted pair, was used to connect the network.

Because we wanted to find the maximum performance for each adapter, we changed only the adapter and driver in the file server. In each of the 12 load workstations, IBM 16/4 Token-Ring Adapters with drivers capable of sending and receiving 4K-byte frames (packets) were used.

Changing the cards in the workstations could have changed the number of load stations required to overload the server, but past testing experience indicates it would not have changed the maximum aggregate network throughput.

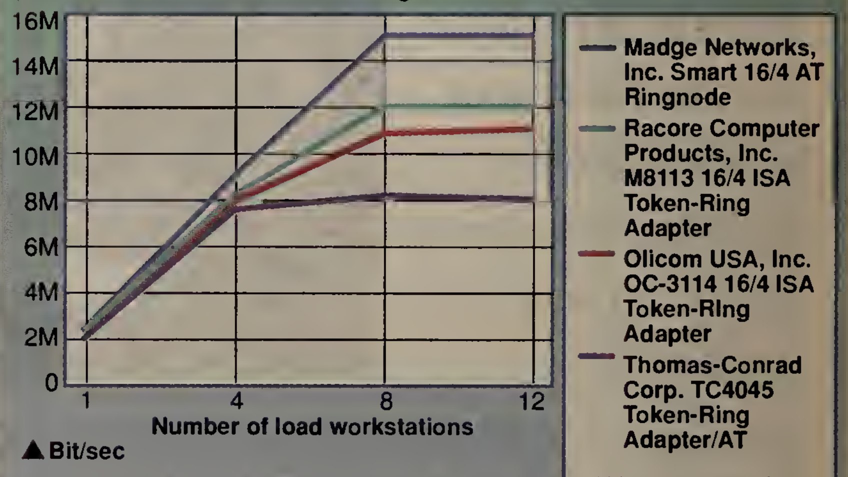
Each test was run three times at one, four, eight and 12 workstations. Each group of three runs was compared to ensure that the systems were stable as well as reliable and had typical run-to-run variations of less than 1%. We then averaged each of the three-run groups to come up with the aggregate network throughput.

In a typical network installation, far more than 12 users would be required to generate the level of traffic produced by these tests. Even a network of 75 or 100 active users would probably put less demand on the server's adapter, except for an occasional peak lasting only a few seconds.

If, for example, 10 users on a network like the one used in this test were to send or receive 100K-byte files simultaneously from the file server's disk cache, they would generate a network load equivalent to ours — but not for long. With the fastest network interface card in our tests, it would take only 0.5 seconds to transfer all 10 files. With the slowest card, it would take 1.6 seconds. If the 10 users staggered their requests by one second, the differences would be all but lost. With any of the test cards in the server, it would take approximately 0.5 seconds to transfer each of the 10 files.

ISA adapter performance

Figure 2



Tests on Industry Standard Architecture adapters were run using Novell, Inc.'s Perform 3 under NetWare 286, a Compaq Computer Corp. 386/33-110 server with 8M bytes of RAM and 12 Intel Corp. 80286-based, 8-MHz IBM PC/AT clones.

4 K-byte packet drivers: Madge and Racore

2K-byte packet drivers: Olicom and Thomas-Conrad

GRAPHIC BY SUSAN SLATER

SOURCE: LANQUEST LABS, SAN JOSE, CALIF.

The results

The adapters that exhibited the greatest throughput were Madge Networks' Smart 16/4 AT, followed by the two 4M/16M Racore cards — the M8113 ISA and M8114 MCA — and the two 4M/16M Olicom cards, called the OC-3114 ISA the OC-3128 MCA (see Figure 2, this page, and Figure 3, page 55).

All five of these adapters achieved a throughput that exceeded Ethernet's theoretical 10M bit/sec capacity. In fact, the fastest card we tested, the Madge Networks Smart 16/4 AT, attained an amazing 14.9M bit/sec. (We intended to test a Madge Newtworks MCA adapter as well but were unable to obtain one in time to conduct a test for this article.)

Part of the reason for the excellent performance of both Madge Networks' and Racore's products was the use of 4K-byte data frames in this test. The effect of using this frame size is clear in Figure 4 on page 55, which compares the Madge Networks Smart AT 16/4 adapter's performance under three different configurations. When the packet size was lowered from 4K bytes to 1,000 bytes, performance fell by one-third.

Because of constraints within the network operating system, Madge Networks recommends using 1,000-byte frames with NetWare 286 but will provide 4K-byte drivers to users that want them. Racore provides and recommends a 4K-byte packet size under NetWare 286 but also offers 1,000-byte drivers.

Olicom's ISA and MCA adapters come with 2,000-byte drivers, although Olicom has indicated that 4K-byte packet drivers are available.

It is possible that with 4K-byte packet drivers, Olicom's already impressive throughput might have been even higher.

Thomas-Conrad's TC4045 Token-Ring Adapter/AT turned in respectable performance, even though it also came with only 2,000-byte drivers. Thomas-Conrad has indicated that it can provide 4K-byte drivers, which, like Olicom, might improve its product's performance.

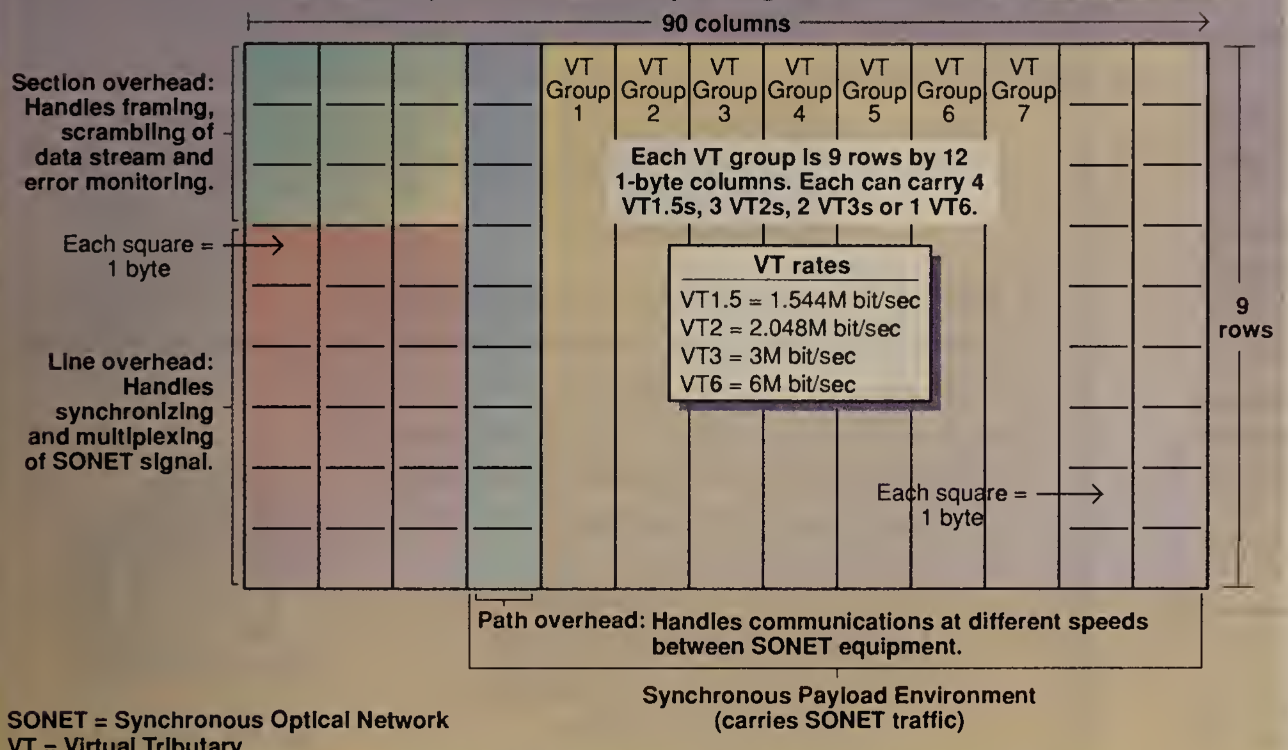
Many 4M/16M adapters may be used in 8-bit slots by switching them from 16-bit to 8-bit mode. This permits them to run in IBM Personal Computer XT-level machines and to function in

(continued on page 55)

SONET's building blocks

Figure 1

The basic Synchronous Transport Signal Level 1 frame


S O N E T
90 columns
Section overhead: Handles framing, scrambling of data stream and error monitoring.
Each square = 1 byte
Line overhead: Handles synchronizing and multiplexing of SONET signal.
VT Group 1
VT Group 2
VT Group 3
VT Group 4
VT Group 5
VT Group 6
VT Group 7
Each VT group is 9 rows by 12 1-byte columns. Each can carry 4 VT1.5s, 3 VT2s, 2 VT3s or 1 VT6.
VT rates
VT1.5 = 1.544M bit/sec
VT2 = 2.048M bit/sec
VT3 = 3M bit/sec
VT6 = 6M bit/sec
9 rows
Each square = 1 byte
Path overhead: Handles communications at different speeds between SONET equipment.
Synchronous Payload Environment (carries SONET traffic)

SONET = Synchronous Optical Network
VT = Virtual Tributary

Like a T-1 frame, a SONET signal is transmitted sequentially, but it is depicted as a matrix for ease of comprehension. SONET has enormous speed — 51.84M bit/sec to a theoretical upper limit of 13.2G bit/sec. SONET's frames can carry as many as 28 T-1 circuits. Some of the columns in the payload may be blank.

GRAPHIC BY SUSAN SLATER

SOURCE: RESTON CONSULTING GROUP, HERNDON, VA.

SONET set to soar

continued from page 41

frames. In the line overhead, pointers give the exact number of bytes between the pointer action byte and the beginning of an SPE. Thus, each terminal must skip the first three bytes in each row to find the start of the payload.

The payload can start either immediately after the pointer, as will be the case when timing by all network terminals is fully synchronized, or it can begin some number of bytes later, depending on the position of the previous frame. There is no limitation regarding the number of bytes comprising the delay; in most cases, it is a few.

Because even the best atomic timing sources can differ by small but finite amounts, SONET faces this problem: Timing used to generate an SPE at one point in the network may differ from the timing at another point. Each terminal must recalculate the pointer to alert the next receiving terminal of the exact location of the start of the payload (see Figure 2, this page).

SONET solves this problem rather elegantly by allowing the payload to be adjusted in position to compensate for the time. To accommodate timing variances, SPEs are allowed to slip through an STS-1 frame, increasing or decreasing the pointer value at intervals by one byte position. If the SPE rate is higher than the local STS frame rate, the pointer is decreased by one unit so that the next SPE will begin one byte sooner than the earlier SPEs.

Pointers are also used within VTs to indicate the start of a VT payload. This indicator, plus the close synchronization of the network, allows multiplexers to pull off specific frames without demultiplexing the entire signal.

Similarly, the VT pointer allows the content of a frame to be frame- or time-asynchronous with local timing. The pointer identifies the start of VT payloads and, as with STS payload pointers, VT pointer increments and decrements must be tracked.

SONET overhead

SONET section layer overhead in an STS-1 frame consists of nine bytes. Two are framing bytes indicating the beginning of an STS-1 frame. There is one STS-1 signal identification byte. One byte of the overhead, called the Bit Interleaved Parity (BIP) byte, is used for error monitoring. Another byte is allocated to the telephone companies' "orderwire" maintenance requirements, used to communicate between central office and remote peripherals.

Another byte is reserved and will be allocated in the future for network operator or user availability. The remaining three bytes are designated for the section layer data communications channel. This channel is designed to carry maintenance and provisioning information and is referred to as the Embedded Operations Channel.

SONET line layer overhead consists of 18 bytes. All SONET equipment makes use of these channels except for signal repeaters, which operate at the lowest physical and section layer level. The line overhead consists of three STS-1 pointer bytes, one BIP byte for error monitoring, two Automatic Protection Switching bytes, nine data communications bytes forming the Embedded Operations Channel, one byte for orderwire and two bytes for future use.

SONET path layer overhead, which handles communications at different speeds between SONET terminating equipment, consists of one nine-byte column at the beginning of the SPE. One byte of path overhead is used for trace capability, one BIP byte is allocated to error monitoring, one signal-label byte identifies the payload, one status-information byte carries maintenance signals, one byte carries user and operator information, one byte shows multiframe alignment to work with DS0 signaling, and three bytes are reserved for future use.

What the future holds

Some experts believe that there may be difficulties in migrating upward from today's T-1 and T-3 multiplexers to SONET multiplexers. Even though SONET has been designed to be backward-compatible with the existing public switched telephone network, the transition may not be as simple as dropping a SONET card into an existing multiplexer (see "Skeptics scoff at SONET," page 41).

Nonetheless, it seems a safe bet that SONET will provide the fault-tolerant, high-speed fiber transmission infrastructure for the 21st century. Indeed, SONET's ability to help make optical networks self-healing is one of its main contributions.

Robert Davidson, product line manager for SONET at Middlebury, Conn.-based General DataComm, Inc., points out that SONET channel banks or cross-connects will be able to take all the data running on a single fiber — a maximum of OC-48 or 2.4G bit/sec now, and potentially more in later SONET versions — and switch it onto another fiber if that fiber breaks. With current technology, this is not possible.

Add SONET's drop-and-insert capabilities to its fail-safe capabilities, and you have ample reason why consultants such as Brij Bhushan of the Reston Consulting Group in Herndon, Va., and Berge Ayvazian of The Yankee Group in Boston say that SONET has tremendous potential. "It's a very important technology," Bhushan says. "Many firms are very interested in it," Ayvazian adds.

But perhaps the most ringing endorsement comes from a source at a multiplexer maker known for its concentration on packet switching. "SONET is the mainstream technology for the 1990s," says David Owen, director of product marketing for Campbell, Calif.-based StrataCom, Inc. It seems that SONET is more than just a buzz word. ◼

Letters

continued from page 35

sighted nor sophisticated enough to deal with the profit side of the business? The net exec who managed expenses closely was accused of having too narrow a scope of responsibilities. In addition, he was accused of having a short-term focus, making him unprepared for the 1980s.

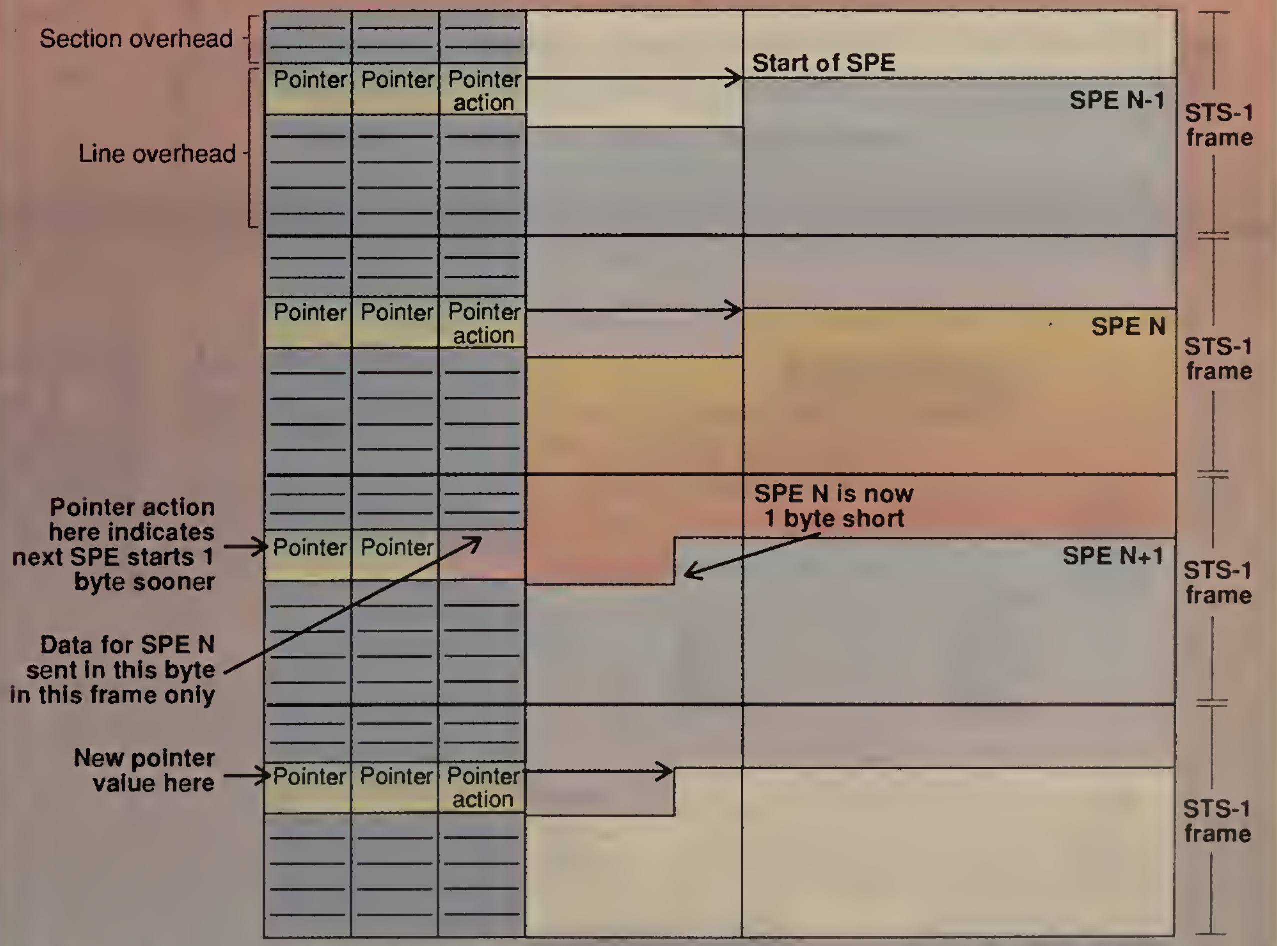
Now isn't it interesting that network managers who attempt to apply technology strategically are being criticized for their allegiance to that technology and not to their companies? Are these the same managers who were obsessed with cost control just a few years ago? Or is there a new generation upon us who haven't learned a thing from their elders?

George Sparks
Manager of
telecommunications planning
Baxter Healthcare Corp.
McGaw Park, Ill.

Synchronizing SONET signals

Figure 2

How payload pointers work



Payload pointers in the SONET frame's line overhead indicate where the SPE begins. Because SONET payloads are not totally synchronous, the timing needed to generate the SPE may differ at various points in the network. If the SPE rate is higher than the STS frame rate, the pointer is decremented by 1, so the next SPE begins 1 byte sooner.

SONET = Synchronous Optical Network
SPE = Synchronous Payload Environment
STS = Synchronous Transport Signal

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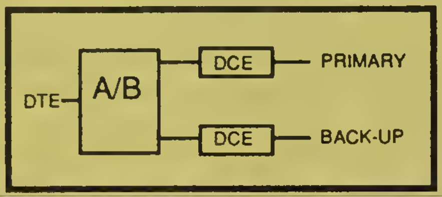

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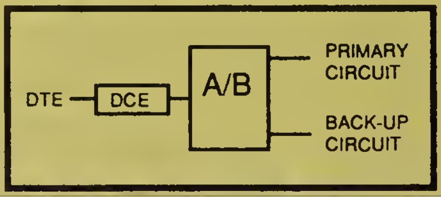

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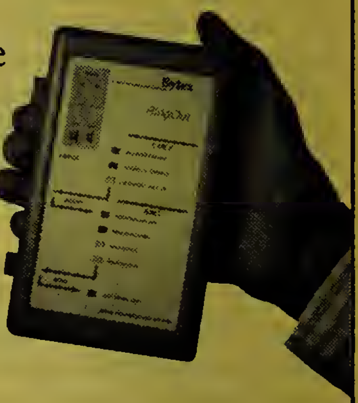

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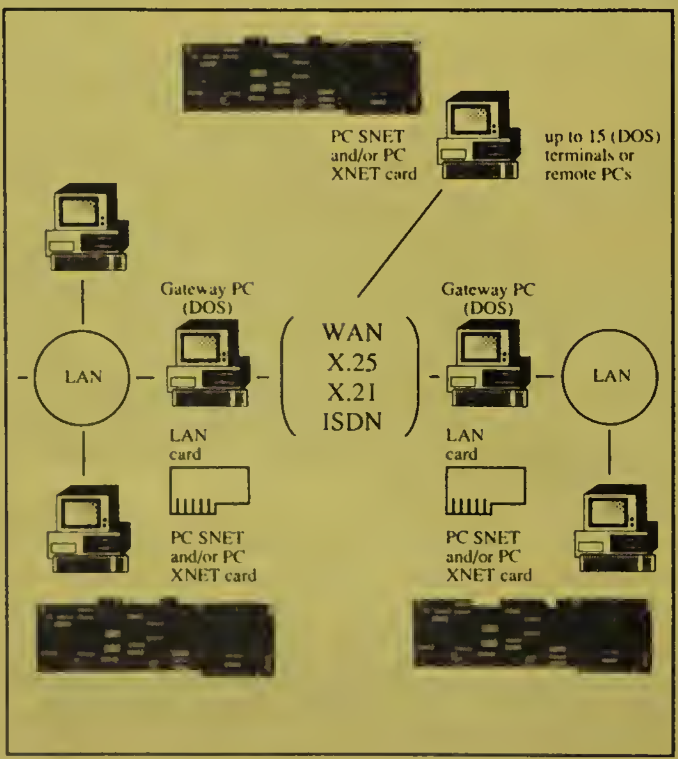
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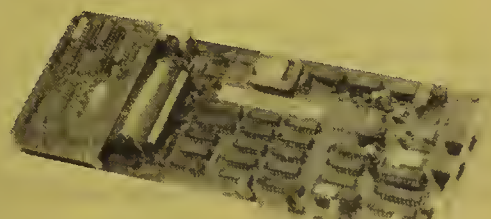

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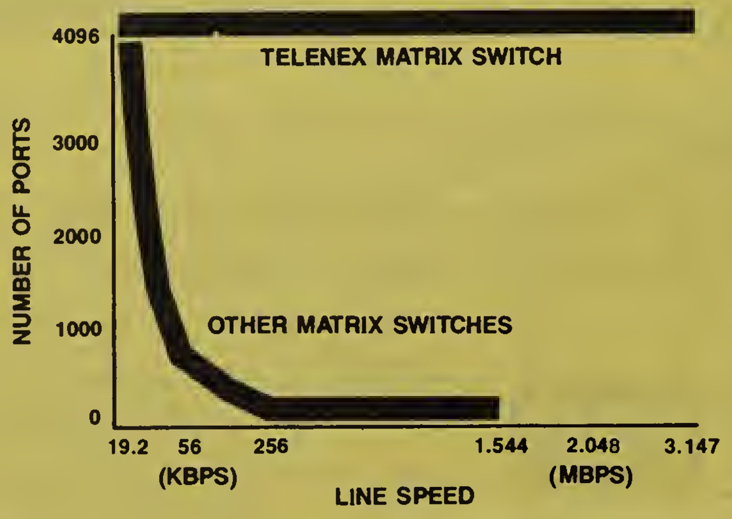

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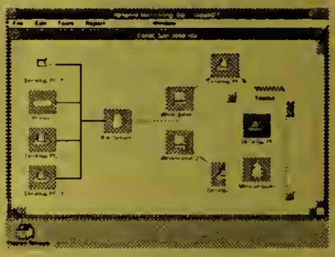

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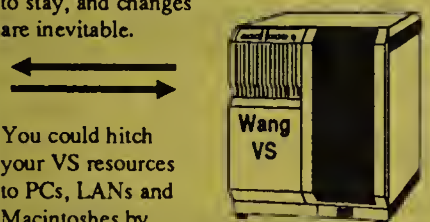

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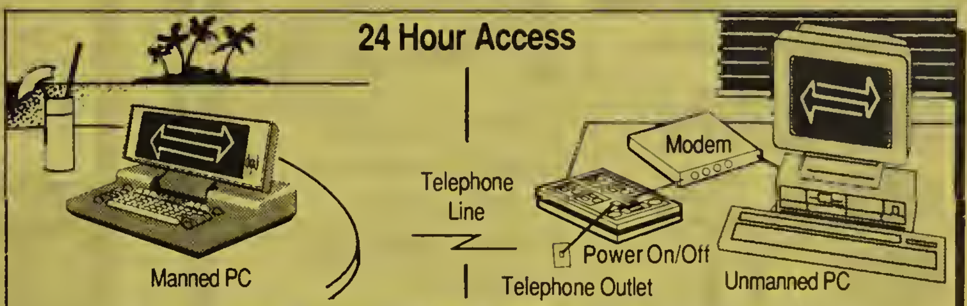

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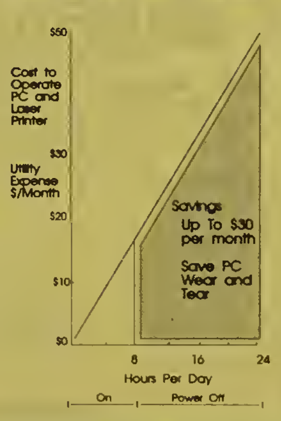

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Token-ring adapters

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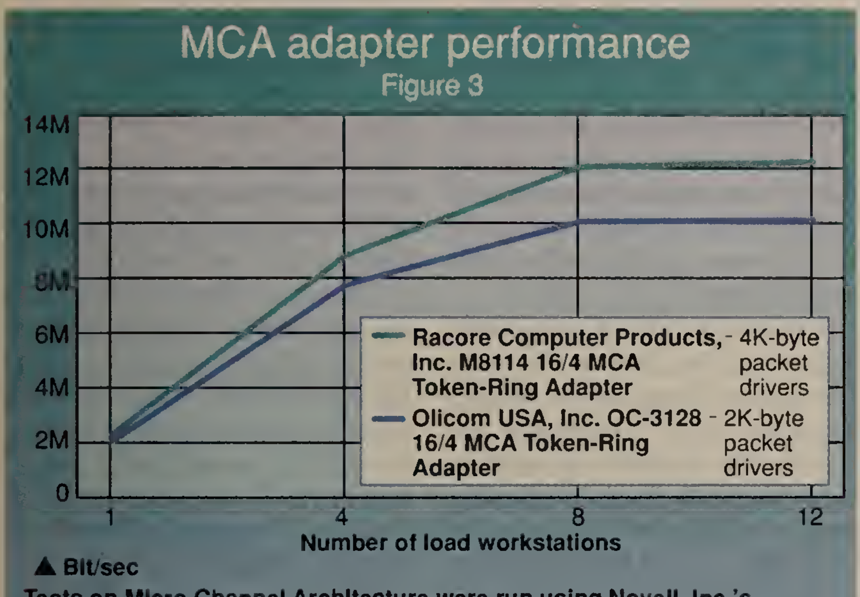
the 8-bit slots of IBM Personal Computer ATs.



MCA adapter performance

Figure 3

Tests on Micro Channel Architecture were run using Novell, Inc.'s Perform 3 under NetWare 286, an IBM PS/2 70-A21 386/25 with 8M bytes of RAM and 12 Intel Corp. 80286-based, 8-MHz IBM PC AT clones.

GRAPHIC BY SUSAN SLATER SOURCE: LANQUEST LABS, SAN JOSE, CALIF.

To find out what impact this had on performance, we moved the appropriate jumper on Madge Networks' Smart 16/4 AT, forcing the adapter into an 8-bit mode, and ran our tests again. Performance fell by more than half. Although at 4M bit/sec, running in 8-bit mode may have little impact on performance, at 16M bit/sec, bus width is clearly an important factor.

Trade-offs

The remarkable performance shown by the fastest adapters is due largely to the use of 4K-byte frames for transferring data across the network. The network adapters in the workstation and server establish a packet size before exchanging data. If, for example, one is capable of 2,000-byte packet sizes but the other cannot go above 1,000 bytes, all transfers between those two computers will default to a maximum frame size of 1,000 bytes.

Big frames require big buffers, so the server must reserve additional RAM for the adapter drivers.

▲▲▲

Not all computers on the network need to have the same maximum frame size. Even if the server has drivers for 4K-byte frames, some workstations can still use 1,000-byte frames, while others use 2,000-byte frames and still others use 4K-byte frames.

If your applications ask for programs or data in large chunks, a large frame size can significantly speed up the process of moving that data across the network. Thus, there is an incentive to increase the server's frame size.

Under NetWare 286, however, this approach brings with it a significant penalty. Big frames require big buffers, so the server must reserve additional RAM for the adapter drivers.

With NetWare 286, the constraints of the operating system are such that only 2,000 to 12K bytes of NetWare DGroup RAM are available in the server for what NetWare calls File Service Process (FSP) buffers.

An FSP is the mechanism by which a workstation's requests are carried out — analogous to checkout lines in a supermarket. If there is only one checker and the store is busy, everyone has to wait his turn. But if there are 10 checkers, patrons can check out in parallel. Likewise, with one FSP, requests from workstations will be carried out one at a time, but with more FSPs, requests can be processed in parallel.

A 1,000-byte packet driver requires 1,992K bytes of RAM of FSP buffer, while a 2,000-byte driver requires 3,016K bytes and a 4K-byte driver requires 5,064K bytes. As you can see, this can rapidly diminish the number of available FSPs, thereby harming network performance.

The overall effect is that 4K-byte packet drivers are impractical in many NetWare 286 servers, including those with more than one network adapter, with one adapter and a number of spooled printer ports, or those with one adapter and one or more very large hard disks.

The way to determine whether users can improve system performance with 2,000- or 4K-byte packet drivers is to examine the target file server while it's running with 1,000-byte drivers. From the NetWare server's ":" prompt, type CONFIG and read the number of FSPs remaining.

If you have five or more remaining and you don't plan to add many more users or printers or to upgrade to a larger hard disk, you can probably switch to 2,000- or 4K-byte drivers. If you have four FSPs, you can probably move to 2,000-byte drivers, perhaps even if you only start with three FSPs.

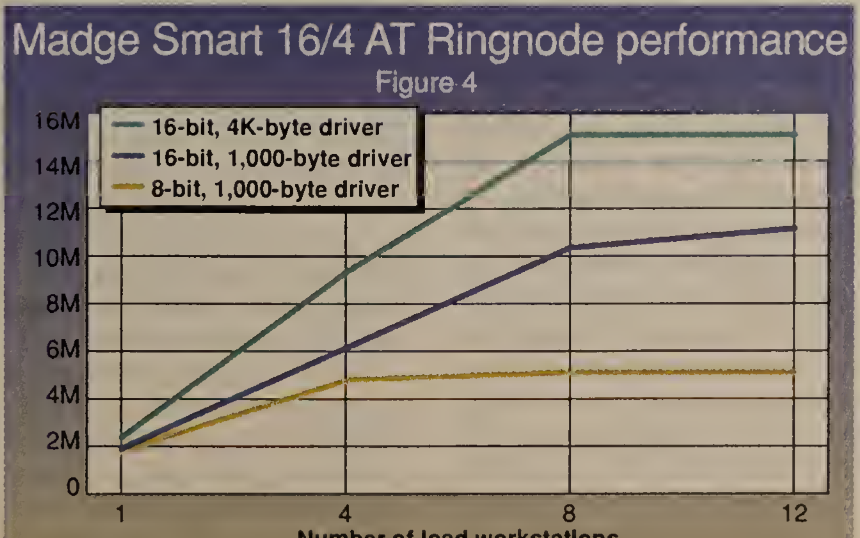
But if you have only two FSPs, you won't be able to improve server response by changing to a larger packet size. You'll improve the data transfer rate through the network interface card, but the file server will process requests in serial instead of handling them in parallel.

An FSP is the mechanism by which a workstation's requests are carried out.

▲▲▲

Finally, if you currently have only one FSP, you're in trouble. Your network is probably not performing at its highest capacity, which means it may be time to move spooled printers or internal bridging to a different server.

For additional information on this subject, contact Novell's systems engineering division for a research report titled "NetWare Internals and Structure." ⧉



Madge Smart 16/4 AT Ringnode performance

Figure 4

Tests were run using Novell, Inc.'s Perform 3 under NetWare 286, a Compaq Computer Corp. DeskPro 386/33-110 server with 8M bytes of RAM and 12 Intel Corp. 80286-based, 8-MHz IBM PC AT clones.

GRAPHIC BY SUSAN SLATER SOURCE LANQUEST LABS, SAN JOSE, CALIF.

IBM hosts to get APPN boost

continued from page 1

36 minicomputers. Support for APPN on hosts and front-end processors will let the machines communicate as peers with any other IBM processors that support PU Type 2.1, such as AS/400s or OS/2 Extended Edition workstations. It will also ease the task of configuring Systems Network Architecture nets since any Type 2.1 node would be able to identify itself to the host upon connection to the network.

"It would be a radical shift for the SNA architecture," said David Passmore, a partner at Ernst and Young's Network Strategies, Inc. in Vienna, Va. "If they did this, I'd view it as the most significant SNA announcement in 10 years."

For example, support for APPN on the mainframe would be an indication that IBM is ready to support Type 2.1 on devices such as the 3174 cluster controller. That could obviate the need for users to manually define all their 3270 devices.

Thomas Routt, president of Vedacom Corp., a consultancy in Seattle, said IBM last September announced support for APPN under DPPX/370, an operating system that originated with the older 8100 distributed processing system but now runs on new low-end Enterprise System/9000 hosts.

"DPPX is not a mainstream operating system like MVS or VM, but it's a host operating system," Routt said. "On that basis, I speculate we'll see APPN under NCP."

Another product announced last September that can be considered a step toward peer-to-peer networking in mainframes was a dynamic network access feature that gives Type 2.1 logical units access to a host without requiring that they be predefined in VTAM and NCP ("IBM unveils bevy of VTAM enhancements," *NW*, Sept. 17, 1990).

Also unveiled was a feature that lets a single node attach to two different NCPs, giving a user multiple data paths, said Rick McGee, manager of communication systems architecture at IBM. In a recent interview about IBM's local-area network interconnection strategy, McGee reaffirmed IBM's commitment to APPN.

"VTAM and NCP routing will change to be more APPN-like," he said, although he was not referring to any specific upcoming announcements.

Along with the APPN introduction, IBM is expected to announce a doubling of the CPU power for its 3745 front-end processor plus an increase in the 3745's memory and storage capacity.

Analysts said this will not only let users hang more devices off their front-end processors, it will enable the front end to support more token-ring network interfaces and higher speed lines. ⧉

SNMP repeater to fill lineup

continued from page 2

Users can manage the repeater in three ways, according to Howard. The concentrator includes an RS-232 port for connecting a console that monitors activity within the hub itself; AT&T's personal computer-based Starlan network management station can be used to monitor the hub as a Starlan device; or AT&T's Unix-based SNMP management station can monitor the hub as an SNMP device.

Multivendor network management "is the direction most of us are moving in," said John Kingland, director of telecommunications at Iowa State University of Science and Technology.

In addition to SNMP support, the 10BaseT Ethernet multiport repeater employs a technique that provides more secure communications than traditional broadcast Ethernet, AT&T said.

With the repeater, the network administrator assigns a media access control-layer address to each port on the hub and the hub tracks the source and destination addresses of packets in real time. "A station connected to the hub can only read data addressed to it," the source said.

Among other LAN products AT&T is expected to introduce is a version of its Fiber Distributed Data Interface-to-Ethernet bridge that supports four Ethernet connections. The current version of the Starwan Multi-Bridge, introduced in June, supports two Ethernet connections.

AT&T will also announce plans to build an FDDI-to-FDDI bridge that has a throughput of 40K packet/sec, double the throughput of the routers AT&T currently offers for linking FDDI nets, Howard said.

In addition to LAN products, AT&T is expected to announce a closer relationship with cisco Systems, Inc. AT&T is an OEM for cisco Systems' bridge/routers.

The strengthened relationship will be highlighted by the addition of cisco Systems' low-end IGS router to AT&T's list of OEM products. AT&T has OEMs for cisco Systems' AGS and AGS+ high-end routers.

The IGS is a two-port router introduced by cisco Systems last September that is priced comparably with Ethernet bridges.

AT&T will also offer a cisco Systems software upgrade for the routers that boosts throughput and adds a frame relay interface as well as support for the point-to-point protocol, according to Howard. AT&T will add cisco Systems' token-ring connection to the high-end routers as well.

According to Howard, cisco Systems will use AT&T as a beta-test site for new products. ⧉

AT&T slips with safeguards

continued from page 1

First National Bank of Boston and a large AT&T 800 customer. "We don't want [AT&T] 800 services to fall below our quality and reliability levels."

AT&T, for example, promised to install digital trunks to link its points of presence to local exchange carrier central offices in the top 20 to 25 local access and transport areas, thus providing emergency alternate paths for 800 traffic.

The facilities, which would safeguard against cable cuts, were supposed to be installed by year end 1990.

Michael Antieri, division manager of inbound services, service development and management with AT&T, said the carrier is just now installing the first trunks in one of its regional Bell holding company regions.

"We want to learn from the first effort and determine what its impact is on 800 [service] customers," Antieri said. "We are working with the other RBHCs to determine the best method to protect access."

AT&T believes interconnecting its Common Channel Signaling System 7 (CCS7) network with RBHC signaling nets is another option for protecting originating access that merits evaluation, although the scheme has at least one drawback.

"Because each RBHC may implement network interconnection a little differently, it's not clear that the things we had planned for protecting originating access will sustain themselves after we go to network interconnection," Antieri said.

CCS6 network

AT&T is also behind in its efforts to establish a backup signaling network for 800 service, a quest originally scheduled to be completed and operational by year end 1990.

The network, dubbed Alternate Signaling Transfer Network (ASTN), will be based on AT&T's existing CCS6 network and will back up the more advanced CCS7 network. In the event of a signaling system impairment or outage, AT&T could use ASTN to handle signaling between its 4ESS switches.

Although delayed, the backup network will give AT&T an edge over rivals that are still installing their first signaling nets to support advanced 800 services.

Antieri said the project is almost two-thirds complete and will likely be wrapped up by the end of the first quarter. He gave no reason for the delay.

In the event of a CCS7 disruption — such as the Jan. 15, 1990, outage, which crippled call centers for 800 service across the nation and left AT&T unable to complete 50% of switched calls for several hours — the carrier will be able to switch from CCS7 to the CCS6 net with minimal disruption to users.

AT&T has delayed by more than a year a key 800 service reliability project in which the carrier would split up and disperse its 74 Network Control Points, which are built in matched pairs with a built-in redundant processor for each device in the pair. Network Control Points are used to translate 800 numbers into actual telephone numbers with area codes and exchange digits.

> "We don't want [AT&T] 800 services to fall below our quality and reliability levels."
>
> ▲▲▲

By splitting up and physically relocating them, AT&T increases their chances of weathering disasters and improves the likelihood that Signal Control Points (SCP) will remain accessible. Under this plan, AT&T will double the number of Network Control Points, from two to four, that would have to be disabled in order to block access to an SCP.

The new NCP configuration was expected to be in place by the end of 1991, but now the project is not expected to be launched until the end of 1992, Antieri said.

AT&T decided to first replace existing Network Control Points with more powerful units that support greater capabilities, which he declined to discuss. "It makes the most sense for us to wait until we've deployed the new" units before dispersing them, Antieri said.

Although later than originally expected, AT&T has rolled out alternate number translation (ANT), a further safeguard against Network Control Point failure. The carrier has equipped its 114 4ESS switches to provide emergency translation of critical 800 numbers.

Brighter side

On the brighter side, AT&T is ahead or on schedule with two safeguards that would help overall network reliability.

The company is ahead of plan in its deployment of Fast Automatic Restoration, a routing algorithm used to instruct T-3 Digital Access and Cross-Connect Systems to reroute traffic around congestion and failed facilities.

And AT&T is on schedule with the upgrading of its 4ESSs to support Real-Time Network Routing, a capability that will enable it to boost the number of call paths through its network from 21 to 113 (see "Advanced routing, DACS key to self-healing nets," this page).

AT&T was also on schedule with the introduction of two Megacom 800-specific service features designed to improve service reliability: Split Access Feature Egress Routing (SAFER) and Alternate Destination Call Routing (ADCR).

SAFER is designed for customers with a single call center supported by a T-1 line. If the 4ESS switch serving the center cannot complete calls over the T-1, calls will be routed to another 4ESS and then be routed over a separate T-1 line.

ADCR is targeted at 800 service customers with two or more call centers. With ADCR, 4ESSs can direct calls to other prespecified sites if the first site is knocked out or busy, Antieri said. The feature enables 800 service users to deal with problems such as on-premises switch failures, building floodings and bomb threats, he added.

Wang intros OPEN/image

continued from page 6

more imaging applications are added, he will need the additional bandwidth offered by 100M bit/sec Fiber Distributed Data Interface networks.

OPEN/image for NetWare is a major step in Wang's strategy to make its image processing software available on other vendors' systems, analysts said.

"There is a need in the market for a LAN-based imaging system from a major vendor," said Michael Neubarth, an analyst with the META Group, a consulting firm in Westport, Conn. He added that many users will be pleased that Wang is attempting to separate its imaging software from its proprietary VS minicomputer hardware in an attempt to fill that void.

OPEN/image for NetWare server software is priced at $10,000; it costs $295 for each client.

Wang will also upgrade its existing microcomputer-based OPEN/image Windows software to run under Microsoft Windows 3.0. Wang offers two OPEN/image Windows packages: the $495 OPEN/image Windows Cabinet, an application enabling microcomputers to create and manage image data bases; and the $995 OPEN/image Windows Image Development Kit, which enables users to build custom image processing applications that work with OPEN/image Windows Cabinet.

Together these packages let microcomputers with directly attached optical storage devices run image processing applications.

Some 800 users find safety in arms of other carriers

By Bob Wallace
Senior Editor

In the year since AT&T's January 1990 network outage, some customers that relied heavily on AT&T 800 service for telemarketing or customer service operations have added other carrier's 800 offerings to their service mix for insurance against a major network disaster.

Despite a raft of safeguards announced by AT&T to minimize the impact of any future outage, longtime AT&T customers including First Union Corp. and The First National Bank of Boston have turned to MCI Communications Corp. and US Sprint Communications Co. for protection.

First Union, a Charlotte, N.C., bank holding company, lost service to its mortgage banking operations for four hours during AT&T's Jan. 15, 1990, outage. The company has since replaced AT&T with US Sprint as its primary 800 carrier.

"We got clobbered," said George Mattingly, vice-president and telecommunications director for First Union.

In an interview last week, Mattingly said, "We gave 80% of the 800 business AT&T had to US Sprint." The rest was split among Advanced Telecommunications Corp. (ATC), a regional carrier located in Florida, and AT&T, whose lines are only used as backups. First Union is now one of US Sprint's top customers for 800 service, Mattingly said.

"Now it's unlikely that any event in the world short of a nuclear holocaust would destroy my network," Mattingly said. "Impair it? You bet, but not the way we were hit last year."

Although AT&T is still the primary 800 service provider for The First National Bank of Boston, that will change by the end of 1992 as the bank splits 800 traffic among AT&T, MCI and US Sprint.

"We can't afford not to distribute our traffic," said John Doggett, telecommunications director for the bank. "If one of them is hit by a major outage, we have to be able to switch traffic to other carriers."

Bill Grant, telecommunications specialist for L.L. Bean, Inc. in Freeport, Maine, said AT&T's new 800 protection features, which were announced in the wake of the 1990 network outage, are attractive but he could not justify their use for any applications. "With all of these features, users have to ask, 'Does it fit my budget, does it fit my business profile and does it answer an application need,' " he said.

John Schefcik, telecommunications director for Northwest Airlines, Inc. in Minneapolis, said, "Generally speaking, we're quite satisfied with the corrective measures AT&T has taken and the [safeguards] they are implementing."

But Northwest has no plans to use any of the features. Schefcik said, "We've opted for overflow [to the public net] to take the place of many of those advanced features. We believe this is a more cost-effective alternative."

Advanced routing, DACS key to self-healing nets

By Barton Crockett
Senior Editor

As the tally of debilitating network outages grows, carriers are scrambling to implement new technologies to protect users from network failures.

New, intelligent digital access and cross-connect systems (DACS) and advanced call routing systems are bringing the dream of the self-healing public net closer to reality by enabling carriers to more quickly and efficiently route private-line and switched traffic around outages.

These advances are critical since even users with highly resilient networks can be stung when carrier outages expose unforeseen points of failure. One example is the recent AT&T fiber-optic cable cut in New Jersey that took down at least 10 T-1s on General Electric Co.'s private backbone network ("N.Y. rocked by big AT&T fiber outage," *NW,* Dec. 31/Jan. 7).

"This should not have happened," said Stan Welland, GE's manager of corporate telecommunications. "We should not have been affected so badly. But it's often the case, as it was here, that you don't find out about a vulnerability until a failure happens."

Helping private nets

For private network users, probably the most significant new technology that carriers are installing is the intelligent DACS, which can automatically reroute T-1 and T-3 circuits around cable cuts and other outages.

For example, AT&T is ahead of schedule in deploying Fast Automatic Restoration (FASTAR), a routing algorithm used to instruct T-3 DACSs to reroute traf-

(continued on page 58)

3Com bows out of LAN mart

continued from page 1

servers and Systems Network Architecture connectivity products; focus marketing and development on adapters and enterprisewide networking products such as hubs, bridges and routers; and cut its 1,935-person work force by 12%.

In 3Com's most recent quarter, adapters accounted for about 61% of overall revenue, work group products provided 19% and internetworking products contributed 20%. 3Com officials said network operating system software sales, lumped into the work group product category, accounted for less than 10% of overall revenue.

After it sells off its work group-related products, 3Com said it hopes to grow its internetwork product business to the point where it will contribute half of the company's total revenue.

Implementation of the program will result in a $45 million charge against third-quarter earnings. The write-off will cover employee severance expenses and costs associated with migrating customers from 3Com to Microsoft net operating system products.

3Com has hired an unnamed investment banking firm to help sell off its work group businesses, preferably by the end of May.

Eric Benhamou, 3Com president and chief executive officer, said his company's exit from the network operating system market was accelerated by Microsoft's decision last year to sell its own version of LAN Manager. Previously, Microsoft only sold LAN Manager through 3Com and other OEMs.

3Com holds a 50% share of the LAN Manager market, with the remainder of the market split between IBM, Microsoft, AT&T and other LAN Manager OEMs, according to International Data Corp., a market research firm in Framingham, Mass.

"We still expect LAN Manager will be a major force in the industry in the '90s," Benhamou said. "But it is very clear that it is not up to us to spearhead that market development task. Microsoft has to play that role."

Transition plan

Microsoft and 3Com officials pledged that their companies would work together to provide users of 3Com's 3+ and LAN Manager-based 3+Open products with a smooth transition to Microsoft's LAN Manager.

Effective immediately, 3Com will stop selling 3+Open 2.0 for personal computer-based servers. It will continue to sell 3+Open on its 3Server network servers but will bundle Microsoft's version of LAN Manager with the servers when the next version of LAN Manager is delivered, which most likely will be later this year.

Because 3Com is trying to sell its server business, it does not plan to bundle LAN Manager with servers for long, Benhamou explained.

Current 3+ and 3+Open 1.1 users will be offered software tools to migrate to either the existing or forthcoming version of Microsoft's LAN Manager at their own pace, said Alan Kessler, vice-president and general manager of 3Com's distributed systems business unit.

The Microsoft/3Com accord also calls for 3Com to license to Microsoft value-added software it developed for 3+Open that gives Macintosh users access to LAN Manager nets. In addition, 3Com will license to Microsoft software that lets users access resources in both LAN Manager and Novell, Inc. NetWare environments.

Microsoft has not set a date for incorporating the NetWare and Macintosh connectivity software into its own version of LAN Manager, though Murray said enhancements using the technology can be expected this year.

In addition, Microsoft has licensed technology from 3Com for use in its development of X.500-based directory services that provide global naming capabilities for all users on a local-area network. This technology is not expected to be implemented in LAN Manager until after the Macintosh and NetWare connectivity is added, Murray said.

3Com has not licensed its Transmission Control Protocol/Internet Protocol value-added software for LAN Manager to Microsoft, but Murray said Microsoft has promised to deliver its own TCP/IP technology for LAN Manager this year.

Warmly received

"I think customers should welcome the convergence of 3+Open and LAN Manager since it wasn't clear where 3+Open ended and LAN Manager began," said Michel Guite, a vice-president at Salomon Brothers, Inc., a brokerage firm in New York. "What this agreement does is formalize something that already existed."

Mark Cuban, president of Micro Solutions, Inc., a Dallas-based systems integrator and LAN reseller, said the agreement should strengthen LAN Manager by combining the best of both companies' products.

"Currently, the offerings for LAN Manager are diluted," he said. "3Com didn't have the resources to accelerate development, and it lagged behind Novell. Microsoft will have 3Com's value-added products through the licensing agreement as well as the resources to accelerate development of LAN Manager."

The agreement will also allow 3Com to focus on what it does best — making adapters and other hardware products.

"It's funny that 3Com has been known for its weakest link — network operating software," Cuban said. "The saying goes that you are only as strong as your weakest link, and now 3Com's getting rid of that so it can leverage what it's good at."

3Com exec explains firm's refocus on hardware mart

Eric Benhamou, 3Com Corp.'s president and chief executive officer, last week spoke with *Network World* Senior Editor Bob Brown about 3Com's plans to withdraw from the network operating system market and to refocus on hardware products.

What's the significance of 3Com getting out of the net operating system market?

These decisions firmly establish 3Com as a global data networking company engaged in two broad businesses — network adapters and enterprise network systems — focused on four product lines: adapters, hubs, communications servers and internetworking all tied together with management products. The announcements also result in a more focused company with greater earning power. In the process of these business changes, we have tried to focus on what would happen to the customer and we have set aside in excess of $25 million to fund a whole range of activities [for] customer migrations. [This includes support for users that stay with 3Com net operating systems, such as 3+, and migration tools for users moving to Microsoft Corp.'s LAN Manager.]

Eric Benhamou

What will LAN Manager users get from Microsoft that they couldn't get from 3Com?

You could certainly have gotten all of the [LAN Manager] elements from 3Com before. But there has been a massive amount of confusion in the market over the past few months regarding the various versions of LAN Manager. Customers have become very nervous as to which one they should commit to. We had to find a way to create a true LAN Manager standard. The main benefit is that users will have the chief LAN Manager champion fully in power to build such a standard.

Did Microsoft's decision to sell its own version of LAN Manager through the retail channel speed 3Com's exit from this market?

It was a catalyst. There was a degradation of our business as a result of the confusion when Microsoft made its move last summer.

Has LAN Manager been a 3Com disappointment?

The whole LAN Manager decision was consistent with a set of strategic decisons we made back in 1987 that had the company focusing on client/server computing. Given that direction, it was completely appropriate for us to be involved in LAN Manager. But that is simply no longer relevant, given that the company will be focusing on networking only.

Is part of 3Com's motivation for diminishing its role in the LAN Manager market that the company needs to be viewed as neutral to net operating systems?

It is important for us to be completely independent of the type of network operating system chosen by the customer. It didn't fit very well for us to push a connectivity solution [tied to one network operating system].

FCC closes loophole

continued from page 6

able to achieve more pricing flexibility than the agency had anticipated.

"Promotional discounts give AT&T pricing flexibility not counted on by the FCC," said Mary Brown, head of the FCC's price cap task force.

Richard Firestone, chief of the FCC's Common Carrier Bureau, explained that price caps are designed to give AT&T the flexibility to offset price increases in one service by cutting rates for another in the same basket.

But the FCC did not anticipate that AT&T would have the potential to exceed the price cap limitation using temporary promotional discounts.

The FCC said the main problem was in the residential basket, where AT&T's rates were at the cap, or the maximum level allowed. A series of promotions, however, made AT&T's residential prices appear to be below the price cap, entitling the carrier to raise prices, Firestone said.

Consequently, AT&T asked to raise its residential rates for the night/weekend period. But if the FCC had allowed the increase, when the promotions expired and rates returned to usual, AT&T's rates would have been above the price cap ceiling, Firestone said.

Because AT&T's prices for the business service and 800 basket are below their caps, promotional activity would not push AT&T over its allowable rates. However, AT&T is still able to selectively justify rate increases for some services based on promotional discounts for others, Firestone said.

In order to solve the problem, the FCC last week changed the price cap rules to prevent AT&T from being able to count promotional discounts as permanent rate reductions in the price cap equation, which sets maximum rate limits for the baskets.

AT&T issued a statement saying it was disappointed with the FCC's decision. "The FCC chose to restrict our incentives to lower customers' bills," the carrier stated. "Their action effectively establishes a layer of regulation that treats some reductions to customers' bills differently from other reductions."

3Com's retreat from LAN Manager worries 3+ users

By Eric Smalley
Senior Editor

3Com Corp.'s decision to back away from the LAN Manager market has left 3+Open users concerned about support and compatibility with future Microsoft Corp. releases of the product.

Last week, 3Com announced that it will no longer sell 3+Open and that it will be seeking a buyer for its workstation and server division.

User concern is due largely to the lack of specific information from 3Com and Microsoft, particularly about how the 3+Open installed base will be moved to LAN Manager.

"Naturally, we're extremely concerned. We're taking a wait-and-see attitude," said Jack Tilbury, telecommunications manager at Rockwell International Corp.'s Network Transmission Systems Division. "It will be interesting to see if Microsoft can become more of an end-user organization."

Current 3+ and 3+Open users will continue to be supported by 3Com, and 3Com will offer users a tool kit to aid migration

(continued on page 59)

New tools ease distribution

continued from page 1

and the need to control the large chunk of software on these PCs," said Dale Vecchio, director of marketing for Systems Center's Net/Master products. "The problem of managing software becomes exponential when you go from five mainframes to 5,000 workstations."

According to Trav Waltrip, vice-president of telecommunications at The Travelers Corp. in Hartford, Conn., "If a user's strategy, like ours, is a network of intelligent workstations connected to LANs that form the foundation of a client/server architecture, there's no escaping the need for distribution functionality.

"To duplicate hundreds of thousands of floppy disks manually and send them to the field is a very expensive proposition, as is the need for trained personnel at the remote site," he said.

The lack of a software distribution mechanism also limits the speed with which new applications can be released, he added.

Ira Morrow, vice-president of technical planning at Shearson Lehman Brothers, Inc., oversees a network of more than 300 LANs and 14,000 workstations. He agreed on the growing importance of software distribution.

"All the major users I know are looking at it, and those that aren't will have to if they want to remain competitive," he said.

Morrow's company is currently testing IBM's SAA Delivery Manager and similar products from two other vendors. Announced last September, SAA Delivery Manager enables users to deliver programs and files from an MVS or VM host to OS/2 workstations. The product, which is not yet generally available, also aids in maintaining software inventories and managing the software licensing process.

Morrow said he is generally impressed with the tools from each vendor but added that they all need to be fine-tuned in order to be really effective.

Morrow's biggest concern, he said, is the reliability of the products' rollback functions.

"If every user has the current version of a program and something goes wrong, we have to be able to do just what we've done on the mainframe — roll back to the prior version. I'm not convinced these products can reliably do that yet," he said.

"The fact that we're rolling out mission-critical business systems on LANs requires us to coordinate and control applications on workstations," Morrow said. "That's a problem a fully developed distribution system will solve."

The Travelers, which has more than 200 LANs and 25,000 intelligent workstations, currently uses an in-house software distribution system that acts mainly as a file-transfer package rather than as a true software administration product. Waltrip said he will migrate to IBM's product once the full capabilities of SAA Delivery Manager are released.

"Delivery Manager will have significant administrative features that our current product lacks," he said. Waltrip said one key function not currently available is the ability to service the DOS workstations and servers.

Other options

Systems Center is beginning development of a software distribution package that will work in multivendor personal computer environments. The product will be a component of its NetMaster integrated network management system. Vecchio declined to say when the product will debut.

"Users are demanding it, so it's awfully high on our priority list," he said.

Spectrum Concepts is also developing a software distribution product based on its flagship file-transfer product, the XCOM 6.2, which supports IBM's LU 6.2 peer-to-peer net protocol.

Mitch Davis, market development manager at Spectrum, said some customers have built their own systems using XCOM.

Other software distribution products include NCR Corp.'s SNA Software Distribution product for OS/2. That offering allows operating system and application software code to be downloaded across a Systems Network Architecture network to LAN servers and clients. It includes an IBM host component and software for each server and client.

Unisys Corp. also announced last fall a software distribution component for its CTOS Incontrol net management software.

Digital Equipment Corp. offers Remote System Manager, which allows a system manager to distribute software to VMS or Ultrix client systems connected via DECnet.

Key to self-healing nets

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fic around congestion and other failures (see "AT&T slips with service safeguards," page 1).

With FASTAR partially implemented in 1991, AT&T will be able to reroute as many as 72 T-3s in 20 minutes. When fully deployed in 1992, AT&T will be able to reroute the same number of circuits in seven minutes, said Michael Antieri, AT&T division manager of inbound services, service development and management with AT&T.

Currently, T-3s have to be rerouted manually, which can take hours. That explains why several hours after the New Jersey fiber cut, only a handful of the 390 T-3s affected were restored to other facilities. If FASTAR had been in place, few users would have noticed the outage, an AT&T spokesman said.

Likewise, US Sprint Communications Co. plans to finish installing a new system of intelligent DACSs by the third quarter of this year. Within a few minutes of any single fiber cut, this system will let the carrier reroute at least 75% of all the traffic affected, said Karl Kramer, US Sprint's vice-president of operations.

MCI Communications Corp. is also implementing new DACSs during the next two years that will increase the resilience of its network, according to Fred Briggs, MCI's senior vice-president of network services. "DACSs are one of the most important elements in the self-healing network," he said. Briggs declined to be more specific.

Switched traffic

To help lessen the impact of switched service outages, carriers are implementing advanced call routing systems to help them avoid failures and busy circuits.

For example, AT&T's 4ESS switches currently can search for as many as 20 alternate paths if the primary path used to complete a call is down. But in the third quarter of this year, AT&T plans to implement a new call routing system called Real-Time Network Rerouting, which will enable each of the 114 4ESS switches in its network to route calls via any other 4ESS switch, vastly increasing the number of call completion routes available, an AT&T spokesman said.

In computer simulations, Bell Communications Research found that a call routing system similar to the one AT&T is implementing can reduce the percentage of calls blocked by a failure in a tandem switch from 6% to about 3%.

The call routing system, called state-dependent routing, also reduces the number of busy signals generated during situations known as focus overloads. Focus overloads occur when a node on the public net is flooded with calls, such as when calls flow into a region struck by a natural disaster.

In a computer simulation, a public network using state-dependent routing blocked only 0.5% of the calls directed at a node during focus overload. By comparison, the standard local carrier call routing system, called hierarchical routing, blocked 2% of all calls directed to the node.

Charlie Pack, a Bellcore division manager, said that one local carrier in the U.S. is currently trialing state-dependent routing.

Senior Editor Bob Wallace contributed to this story.

NCR tool builds OLTPs for Unix

continued from page 2

beck, president of Communications Network Architects, Inc., a consultancy in Washington, D.C.

Some vendors, including DEC, have introduced products enabling users to build distributed OLTP applications. But those products force users to target applications to a single vendor's DBMS. To reach other vendors' DBMSs, users must install additional DBMS gateway software.

"A lot of vendors have products that do what Top End does but in a proprietary way," said Randall Smerik, development manager for transaction processing systems in NCR's Engineering & Manufacturing Division in San Diego. "We're taking what is typically associated with a proprietary world and bringing it to open systems running on Unix."

The product builds on NCR's OLTP experience in the banking and retail markets, which have been strongholds for the company. Previously, NCR offered Multi-Tran TPM software for its high-end 9800 processor.

Like Multi-Tran, Top End manages the flow of data between end users and systems running DBMSs. It tracks each step of the process and uses a two-phase commit protocol to ensure that transactions requiring updates to multiple data bases are totally completed before changes to the data bases are actually made.

Unlike Multi-Tran, Top End is designed to support X/Open Company, Ltd.'s emerging Distributed Transaction Processing (DTP) standard. DTP defines a common set of application program interfaces that enable the TPM software to pass data from a client application to DBMSs running on larger systems.

Users log on to a system running Top End server software from workstations equipped with Top End client software. The server validates the user's password and tells the workstation to generate application screens for entering or viewing data.

Data entered by the user is fed to the server, which builds a data base transaction using standard SQL commands being developed by the SQL Access Group. Top End uses Open Systems Interconnection, Transmission Control Protocol/Internet Protocol or NETBIOS protocols to forward the transaction to the Unix computer running the target DBMS.

Analysts said the introduction of Top End could make Unix more attractive as a vehicle for supporting large OLTP applications, such as those used by airline and hotel reservation systems.

Running an OLTP application in a Unix environment will enable users to choose processing hardware from a mix of vendors and pick the network protocol that best meets their performance objectives, said Rich Schreiber, president of Standish Group International, Inc., an OLTP consulting firm in Hyannis, Mass.

"If you want the autonomy of open systems, you will want to use a transaction processing monitor like this," he said.

Schreiber said NCR could become a leader in the Unix OLTP market if it merges into Top End the expertise it gained in the banking and retail markets with the lessons it learned in building hardware to comply with emerging open systems standards.

But NCR faces a long education process before users will accept Top End, Dzubeck said. Many banks have heavy investments in IBM mainframes and Systems Network Architecture nets supporting OLTP and are not likely to abandon those without overwhelming benefits, he said.

Top End is scheduled for availability in the second quarter of 1991 and will initially be bundled with NCR's System 3000 hardware. Top End server software running on NCR's System 3000 processors ranges from $3,500 to $150,000. Top End client software for NCR System 3000s ranges in price from $1,000 to $7,000, while client software linking DOS-based microcomputers to a server running Top End costs $150.

NETWORK WORLD

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161 Worcester Road
Framingham, Mass. 01701-9172
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IBM modifying SNA

RESEARCH TRIANGLE PARK, N.C. — IBM is at work on architectural changes that will enable its Systems Network Architecture to support a variety of data protocols as well as voice and video, all at gigabit speeds.

Rick McGee, manager of communication systems architecture at IBM here, said the company recognizes users' need to interconnect local-area networks supporting a variety of protocols and is positioning SNA to meet that and other communications demands.

The SNA network of the future will support Open Systems Interconnection, Transmission Control Protocol/Internet Protocol and other protocols and will include a new routing mechanism that will carry data at the gigabit speeds IBM expects carriers to support.

"We're changing [SNA] in such a way that it will not only route SNA data much more efficiently, it will route OSI and TCP/IP data, and it will route voice packets and video packets," McGee said in a recent interview.

He said customers will come to view SNA as an underlying routing technology and not simply as a mechanism for linking devices to hosts.

Today, routing in SNA nets is handled by VTAM on the host and the Network Control Program (NCP) on front-end processors.

Initially, IBM will upgrade VTAM and NCP to include more of the Advanced Peer-to-Peer Networking (APPN) functions already offered in the Application System/400 and System/36 minicomputers (see "IBM hosts, FEPs to get APPN boost," page 1).

Eventually, McGee said both SNA and APPN will have to change to keep up with carrier nets supporting gigabit speeds with low error rates.

"We are making architectural changes that will do routing in a much more efficient way in the lower layers" of the SNA protocol stack, he said. In the future, routing will be a low-level function handled in hardware, whereas today, it is a Layer 3 function performed by software.

Routing protocol

IBM is developing a new routing protocol that will support other LAN or wide-area protocols such as TCP/IP, Network Basic I/O System or Novell, Inc.'s Integrated Packet Exchange (IPX), McGee said. Such a routing protocol would be analogous to those that exist today, such as cisco Systems, Inc.'s Internal Gateway Routing Protocol.

But the protocol IBM comes up with will be "much more efficient and much more reliable than anything we see in the industry today," McGee said.

Asked when users will start seeing some of these SNA changes, he said, "I'm guessing you will see pieces of this new SNA within two to three years in products. You'll probably see it in a big way over three to five years."

To address the LAN interconnection market in the mean time, McGee said, IBM will roll out enhancements that make existing SNA networks a vehicle for linking LANs.

— Paul Desmond

Users set to bring SNA data

continued from page 2

ing down the user's session.

Today, most bridge/routers can support SNA devices attached to token-ring networks. They typically use IBM's source routing technique to let SNA devices find destination addresses.

Alternatively, vendors such as cisco Systems, Inc. encapsulate LAN protocols in IP packets, which makes them easier to route, although it adds overhead.

Either approach fits with many SNA users' long-term strategy of placing devices such as cluster controllers and front-end processors on token-ring LANs. But in the interim, another solution is required to address the huge installed base of SNA devices that are not LAN-attached.

Two vendors — cisco Systems and Wellfleet Communications, Inc. — will address that requirement with a feature that will let users directly attach synchronous devices such as IBM cluster controllers or front-end processors to their bridge/routers ("Router firms to support SDLC traffic," *NW,* Dec. 10, 1990). Wellfleet's announcement is expected this week; cisco Systems' should come later this month.

"I think that's about the best news I've heard in a long time," Brown said. "It's going to revolutionize how we do SDLC."

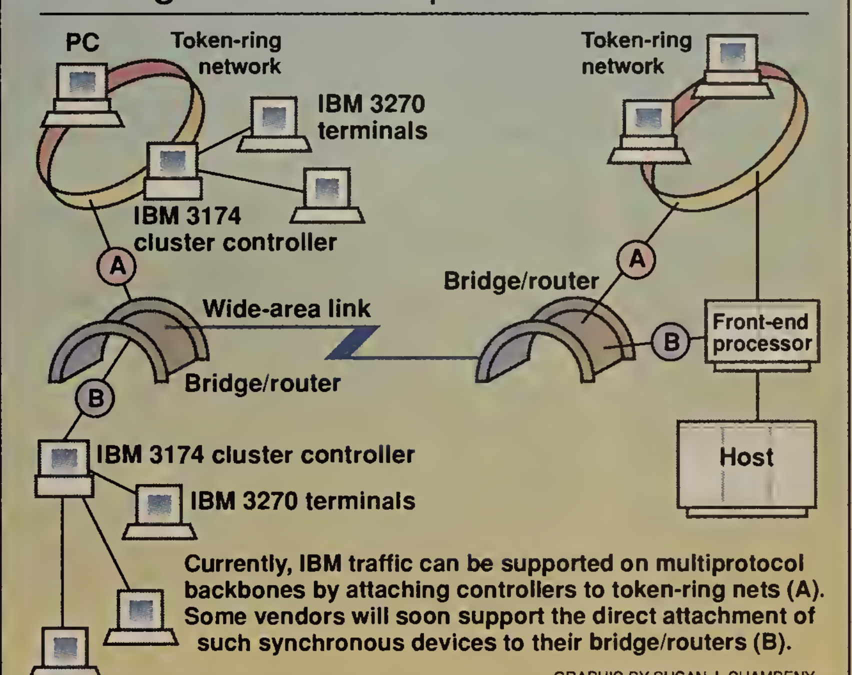
Analog Devices is replacing small IBM mainframes in Norwood and Wilmington, Mass., with one larger one located in Norwood. To give Wilmington terminal users the local response times to which they are accustomed, the company installed token-ring nets to support 3174 cluster controllers. The LANs are attached to the Wellfleet bridge/routers, which also support Ethernet users. A T-1 line connects the sites.

But the token-ring strategy won't solve every problem. For example, the company has remote job entry printers at a site in Ireland that it will support with Wellfeet's Transparent Synchronous Pass-Through feature, obviating the need for dual international data lines and saving about $9,000 a month.

Robin Layland, engineering consultant at The Travelers Corp. in Hartford, Conn., said features such as Transparent Synchronous Pass-Through, or what cisco Systems calls SDLC Transport, will help users cut line costs while they install LANs to support SNA.

That strategy can improve performance of the SNA net, which generally uses 9.6K bit/sec or slower lines. Riding over the LAN internetwork, SNA traffic can share larger bandwidth pipes, such as 56K bit/sec, which should improve response times.

Adding SNA to multiprotocol backbones



Currently, IBM traffic can be supported on multiprotocol backbones by attaching controllers to token-ring nets (A). Some vendors will soon support the direct attachment of such synchronous devices to their bridge/routers (B).

GRAPHIC BY SUSAN J. CHAMPENEY

Layland said he expects the idea of building LAN internets that support SNA and other protocols to catch on rapidly.

"I think it's going to be big this year," he said. "It's just now reaching the SNA shops. Over the next year or two, a lot of them are going to move that way."

IBM said it is working on a new wide-area routing protocol that will support any vendor's data at gigabit speeds(see "IBM modifying SNA," this page).

Layland said bridge/routers are taking over some functions, such as error checking and session tracking, that were traditionally provided by IBM's front-end processor-based Network Control Program (NCP).

Nick Lippis, principal at Northeast Consulting Resources, Inc., a Boston consultancy, said he expects that trend to continue.

"That's where the new opportunities are. It's not the internet; it's SNA," said Lippis, whose firm just published a report on the LAN internetworking trend.

Don Listwin, product line manager for routers at cisco Systems, confirmed Lippis' assessment and said in the future, his company's products will support SDLC without encapsulation.

"[That means] actually understanding SNA routing capability and having routers in general start handling some of that remote routing capability that might previously have been the domain of remote front-end processors," Listwin said.

Today, source routing bridging is employed or announced by such vendors as cisco Systems, Wellfleet and Vitalink Communications, as well as IBM. But source routing has limitations for complex networks because of its seven-hop limit and the inordinate amount of messages it can create in large nets.

Lippis said cisco Systems' technique of encapsulating SDLC frames in IP packets adds the benefits of TCP/IP to SNA nets.

The price for that is about 20 bytes per message, according to Layland, which can be signficant given the amount of receiver-ready messages SNA requires. Users should be able to skirt that problem by adding additional bandwidth, which is a viable solution with line costs dropping. ◻

3Com's retreat worries users

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from 3+ and 3+Open to LAN Manager, according to 3Com officials (see "3Com bows out of LAN software mart," page 1).

3Com's plan to divest its server business is troubling for Rockwell, Tilbury said, because of the company's significant investment in 3Com servers.

"We're going to have to have more details before we can set our course," he said.

The future of 3Com's electronic mail system, 3+Mail, is a concern for users because Microsoft has its own E-mail products. 3Com and Microsoft have yet to address this issue.

"You can expect an announcement from us within the calendar quarter," said a spokesman for 3Com.

Many users anticipate switching E-mail systems. "3Com mail is a dead product. We're looking at putting up cc:Mail and shutting off 3Com mail," said Bob Saur, information systems manager for Index Technology Corp., a software developer in Cambridge, Mass. Saur said he expects the E-mail system change to cost his company about $25,000.

Saur said he is pleased that Microsoft will be assuming responsibility for LAN Manager development. The relationship between 3Com and Microsoft was a factor in Index Technology's decision to go with 3+Open in the first place. "We knew we could fall back on Microsoft," Saur said. "We're very pleased we had that safety net in place."

"[But] we have real concerns about when releases of LAN Manager will be available for 3Com 500 servers. We would have liked to have seen a little more clarity in [3Com's and Microsoft's] statements," he added.

Despite a general level of uncertainty, the user community is far from panicking.

"I think it's probably good for both 3Com and the user community," said Neil Chernoff, a principal with Booz, Allen & Hamilton, Inc., a management and technology consulting company. "LAN Manager development and the future of that development is now focused on Microsoft instead of being fragmented among different vendors."

Booz, Allen & Hamilton has between 1,300 and 1,400 workstations and more than 40 servers on its 3+ and 3+Open networks, he said.

Some users had already planned to migrate from 3+ Open to LAN Manager 2.0 when 3Com made its announcement.

"We have 3+Open in our production environment. Our plans are to move ahead to LAN Manager 2.0 and update all our sites within the year," said Joe Grande, a consultant working with Liberty Mutual Insurance Co. and chairman of the New England 3Com user group.

3Com's pullout from the LAN Manager market won't affect Liberty Mutual's migration plans as long as Microsoft supports the 3Com software and continues to develop 3Com's value-added products, such as Apple Computer, Inc. Macintosh connectivity and X.500 directory services, Grande said.

Liberty Mutual will proceed with its migration to LAN Manager 2.0, even though a new release of LAN Manager is expected later this year.

"What [Version] 2.1 is going to entail is most of 3Com's add-on services," Grande said, adding that he doesn't anticipate any problems upgrading from LAN Manager 2.0 to Version 2.1. ◻

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119. Amdahl
120. AT&T
121. Bull HN IS
122. NCR
123. Data General
124. Wang
125. Hewlett Packard
126. Prime
127. Tandem
128. Unisys
129. Control Data
130. Other

Microcomputers/ Workstations Installed

131. PCs based on 80286 chip
132. PCs based on 80386 chip
133. PCs based on 80486 chip
134. 8086/8088
135. Macintosh
136. RISC-based workstations
137. UNIX-based workstations

Microcomputers/ Workstations Planned for Purchase

138. PCs based on 80286 chip
139. PCs based on 80386 chip
140. PCs based on 80486 chip
141. 8086/8088
142. Macintosh
143. RISC-based workstations
144. UNIX-based workstations

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175. Modems (under 9.6 kbps)
176. T-1 Multiplexers
177. T-3 Multiplexers
178. Fractional T-1 Multiplexers
179. Data Switches
180. Matrix Switches
181. Packet Switches
182. Protocol Converters
183. Network Management Systems
184. Terminal Emulation Boards
185. Facsimile Machines
186. Diagnostic Test Equipment
187. DSU/CSU
188. Data Security
189. Data Compression Equipment
190. Network Adapter Boards
191. Microwave
192. Messaging Software

Telecommunications

193. PBXs (over 1,000 lines)
194. PBXs (200-1000 lines)
195. PBXs (under 200 lines)
196. Key Systems
197. Automatic Call Distributors
198. Voice Messaging Systems
199. Video Teleconferencing Systems

Services

200. Switched Voice
201. Dedicated Leased Line
202. T-1
203. T-3
204. Digital Data
205. Packet Switched
206. Centrex
207. Central Office LAN
208. Satellite
209. On-Line Information
210. ISDN
211. E-Mail
212. VSAT

Plan to purchase these products

Local Area Networks

213. Local Area Networks
214. LAN Servers
215. LAN Services
216. Cables, Connectors, Baluns
217. Bridges, Routers, Gateways
218. UPS
219. LAN Storage Services

Computers/Peripherals

220. Microcomputers
221. Minicomputers
222. Mainframes
223. Front End Processors
224. Terminals
225. Laptops
226. Printers
227. Workstations
228. Cluster Controllers

Software

229. Network Management
230. Micro-to-Mainframe
231. Network Security
232. Call Accounting
233. Distributed DBMS
234. Communications Software
235. Applications Software
236. Network Operating Systems
237. EDI Software
238. E-Mail Software

Data Communications

239. Modems (over 9.6 kbps)
240. Modems (under 9.6 kbps)
241. T-1 Multiplexers
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243. Fractional T-1 Multiplexers
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268. T-3
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271. Centrex
272. Central Office LAN
273. Satellite
274. On-Line Information
275. ISDN
276. E-Mail
277. VSAT

Value of Networking Equipment and Services approved in the last year

278. $100 million or more
279. $50-$99.9 million
280. $25-$49.9 million
281. $20-$24.9 million
282. $10-$19.9 million
283. $5-$9.9 million
284. $1-$4.9 million
285. $500,000-$999,999
286. Under $500,000

Value of Networking Equipment and Services to be approved in the next year

287. $100 million or more
288. $50-$99.9 million
289. $25-$49.9 million
290. $20-$24.9 million
291. $10-$19.9 million
292. $5-$9.9 million
293. $1-$4.9 million
294. $500,000-$999,999
295. Under $500,000

Annual Company Revenue

296. Over $10 billion
297. $1 billion-$9.9 billion
298. $500 million-$1 billion
299. $100 million-$499.9 million
300. $50 million-$99.9 million
301. $10 million-$49.9 million
302. $5 million-$9.9 million
303. Under $5 million

Number of Employees Entire Company

304. Over 10,000
305. 5,000-9,999
306. 2,500-4,999
307. 1,000-2,499
308. 500-999
309. Under 500

Plan to Purchase ISDN Products

310. Basic Rate Interface Term Adapters
311. Primary Rate Interface Equipment
312. Voice/Data Terminals
313. Voice-Only Terminals
314. Data-Only Terminals

Networks evolve, too.

Compare the two leading AppleTalk-Ethernet gateways. You'll find that ours is a generation ahead.

Sure, they both allow Macintoshes to communicate with PCs, VAXs, and Unix computers. But the GatorBox® is the only one that offers wide-area AppleTalk features like tunneling and filtering. Plus advanced IP features like remote monitoring via Telnet. And that's just for starters.

MORE RELIABILITY, MORE MEMORY, MORE SUPPORT.

Designed for reliability, the GatorBox is powerful, too, with four times the memory and a faster processor than the FastPath.

What's more, the new high-performance release of GatorBox software boosts its AppleTalk-Ethernet routing speed by 90%.

Better still, the GatorBox is backed by our guaranteed overnight replacement policy and the most experienced customer support and engineering team in the industry.

Features	GatorBox	FastPath
AppleTalk-Ethernet gateway	■	■
MacTCP and IP support	■	■
AppleTalk Phase 1 and 2 support	■	■
SNMP and atalkad support	■	■
Compatible with GatorMail	■	■
Built-in AppleTalk tunneling over IP backbone	■	
Remote gateway status via Telnet	■	
Overnight replacement policy	■	
One megabyte of RAM	■	
NFS file sharing (with GatorShare)	■	
Unix-AppleTalk printing (with GatorPrint)	■	
Suggested retail price	$2795	$2795

A PLATFORM FOR EASY-TO-ADD NETWORK SERVICES.

The GatorBox, unlike FastPath, is a platform for a family of connectivity software. Including NFS file sharing with GatorShare.™ And, now, printer sharing with GatorPrint™—which allows an entire Unix network to share printers on AppleTalk networks.

Cayman Systems even provides Macintosh-to-Unix mail with GatorMail.™ All of which can be added to your network without wasting valuable time installing special software on your computers.

So why settle for a limited gateway when, for the same investment, you can have a versatile one? Get the GatorBox.

Anything else seems outdated by comparison. For more information, call 1-800-473-4776. Or write, Cayman Systems, 26 Landsdowne Street, Cambridge, Massachusetts 02139. (617) 494-1999, FAX (617) 494-9270.

CAYMAN
SYSTEMS

"GatorBox offers the best blend of sophisticated IP and AppleTalk features." —MacWeek

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Over *300* Ways to Target Your Next Direct Mail Campaign

314 to be exact

That's how many different select options you'll find in **Network World's** subscriber list of enterprise network buyers. No other networking publication gives you that kind of selectivity.

To prosper in today's world of soaring direct mail costs, selectivity is the key . . . .

The key to getting more return on your investment — allowing you to prequalify your list and more accurately target your mailings.

The result is fewer pieces of mail sent for the same desired result. Your key to managing through the postal increase.

The key to helping you write a targeted message to a specific group of people — allowing you to keep relevant messages in front of the people who are really interested.

The result is a focused mailing piece designed specifically for a special group of people. Your key to having the message read by those who are in a position to respond.

Selectivity is your key to a successful direct mail campaign.

And **Network World's** subscriber list offers the most extensive selectivity in the business. Because each and every one of our readers is qualified by a 21-question qualification form each and every year. We not only provide the most comprehensive information on our subscribers, but also the most current.

If you are interested in putting **Network World's** selectivity to work for your next direct mail effort, call Kevin Normandeau at 1-800-622-1108 or fax the form on the inside of this wrap. We're ready to help you design a prospect list that's right for your program.

NETWORK WORLD

Fax it back

508-653-6155

With the Postal Increase Just Around the Corner, I need to be more selective!

☐ Call me at once. Tel. ____________________
☐ Call my agency/list broker. Name ____________________ Tel. ____________________
☐ Send me more information

Name ____________________
Company ____________________
Address ____________________
City ____________________ State ____________________ Zip ____________________

Or Call Kevin Normandeau at 1-800-622-1108 ext. 202 (in MA, 508-820-8202) for further information.

Network World's List Selectivity

Your Key to a Targeted and Cost-Effective Direct Mail Program

Industry
1. Manufacturing (other than comp/comm)
2. Finance/Banking
3. Insurance
4. Real Estate
5. Healthcare Services
6. Legal
7. Hospitality
8. Retail/Wholesale Trade
9. Transportation
10. Utilities
11. Education
12. Process Industries
13. Government State/Local
14. Government Federal
15. Military
16. Aerospace
17. Consultants
18. Carriers
19. Interconnects
20. Manufacturers (computer/communications)
21. VAR/VAD/Systems House
22. Distributor, Computer Related
23. Distribution, Communications Related

Job Function
24. Networking Management
25. MIS Management
26. Corporate Management
27. Data Communications Management
28. Telecommunications Management
29. Financial Management
30. Engineering Management
31. Independent Consultant

Scope of Involvement in Purchase Decisions
32. Enterprise Wide
33. Multi-Enterprise
34. Department Wide

Number of Sites for which Subscriber has Purchase Influence
35. 100+
36. 50-99
37. 20-49
38. 10-19
39. 2-9
40. 1

Primary Responsibility
41. Both Data and Voice
42. Data Networking Only
43. Voice Networking Only

Public Transmission Media
44. Switched Based
45. Leased Line
46. T-1
47. Fractional T-1
48. T-3/SONET
49. Broadband
50. ISDN

Private Transmission Media
51. Satellite
52. Microwave
53. Fiber Optic

Network Type
54. Local Area Network-Within a Building
55. Local Area Network-Campus Environment
56. Wide Area Network-International
57. Wide Area Network-National
58. Wide Area Network-Regional
59. Wide Area Network-Metropolitan

International Purchase Influence
60. Europe
61. Asia
62. South America
63. Australia
64. Middle East

Network Architecture
65. SNA
66. DECNET
67. OSI
68. GOSIP
69. MAP/TOP
70. TCP/IP
71. DCA (Unisys)
72. Other

LAN Operating System
73. Com (3+, 3+ Open)
74. Local Talk (Appletalk)
75. Banyan (Vines)
76. DCA (Irmalan)
77. IBM (LAN Server)
78. IBM (PC LAN Program)
79. Microsoft (LAN Manage)
80. Ungermann-Bass (Net/1)
81. Novell (Netware)
82. TOPS
83. Proteon (Pronet)
84. Other

LAN Environment
85. 4M Token Ring
86. 16M Token Ring
87. Arcnet
88. Ethernet
89. Starlan
90. FDDI
91. Local Talk
92. Other

Operating Systems
93. IBM DOS (VSE)
94. UNIX
95. OS/2
96. OS/2 Extended Edition
97. MVS
98. VM
99. VMS
100. Xenix
101. Pick
102. Other

Mainframes Installed
103. DEC
104. IBM
105. Amdahl
106. AT&T
107. Bull HN IS
108. NCR
109. Data General
110. Wang
111. Hewlett Packard
112. Prime
113. Tandem
114. Unisys
115. Control Data
116. Other

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